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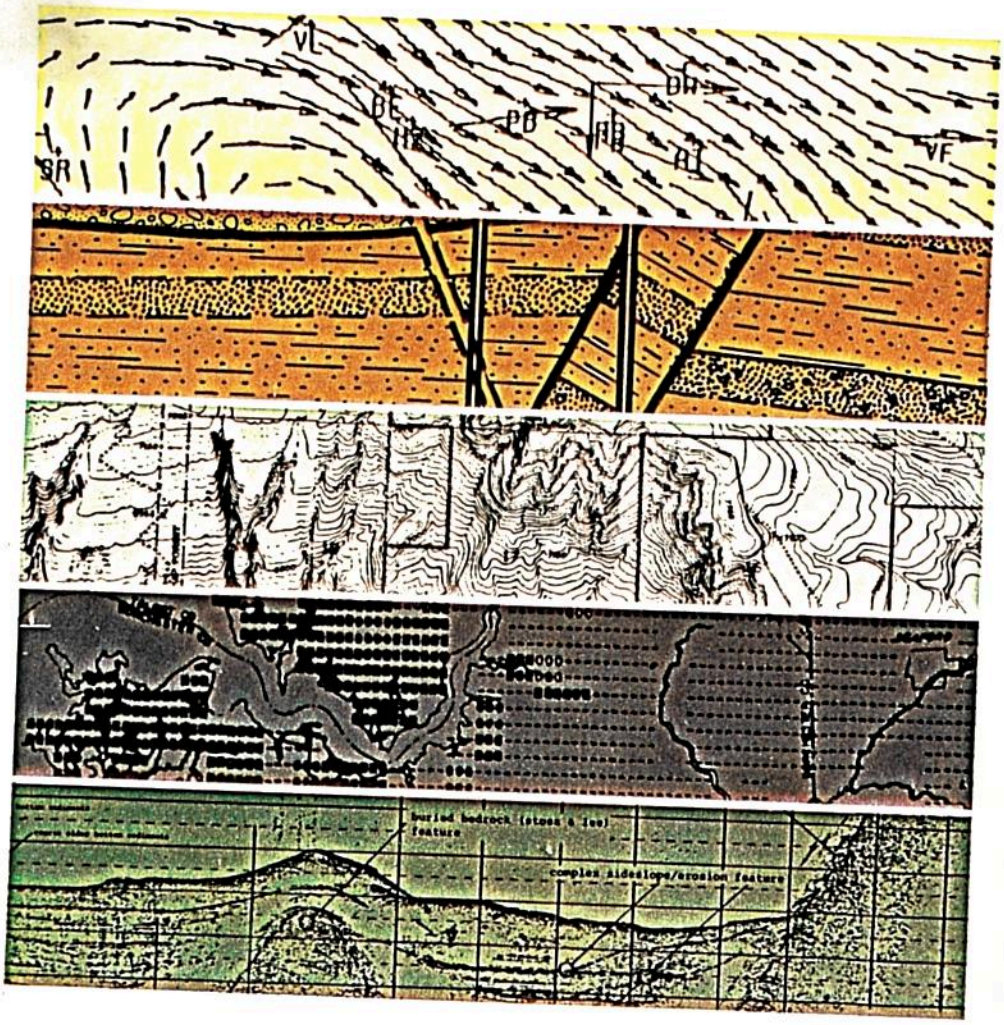

ENVIRONMENTAL ASSESSMENT
VOLUME I OF VI
MACK TRUCKS, INC.
ASSEMBLY PLANT 5C
ALLENTOWN, PENNSYLVANIA

JANUARY 17, 1989

DAMES & MOORE

EXECUTIVE SUMMARY

This Executive Summary presents the general results and current status of Dames & Moore's environmental evaluation of Mack Trucks, Inc. (Mack) Plants 5A and 5C in Allentown, Pennsylvania. The details are discussed in the body of the report. Any additional environmental reports prepared by Dames & Moore will be issued as addenda to this document.

During the previous 18 months, Dames & Moore has performed four programs to evaluate the environmental conditions of Mack's Allentown plants:

I. Environmental Audit

II. Closure of Plant 5C

III. Soil Investigation and Soil Treatment

- Surface Soil
- Subsurface Soil
- Underground Storage Tank Removal and Related Soil Investigations
- Biological Treatment of Excavated Soil

IV. Ground Water Investigations

These four programs are essentially complete. During the course of these programs, Dames & Moore collected and analyzed 550 soil samples for a total of more than 13,000 analyses, and analyzed 70 ground water samples for a total of more than 3,300 analyses. The main objective of this work was to thoroughly evaluate the environmental quality of the property, with the intent of making the property ready for sale.

Dames & Moore understands that Mack has a potential buyer who wishes to use the buildings as warehouses. Although there are some environmental issues that are not resolved, Dames & Moore has evaluated the overall on-site environmental conditions. Dames & Moore believes that the major environmental problems have been identified; Mack intends to remediate these problems. Mack's future remedial efforts should not inconvenience the buyer's warehouse operations or affect the buildings.

A meeting with the Pennsylvania Department of Environmental Resources (PADER) is scheduled for January 23, 1989, to address the remaining issues raised as a result of Dames & Moore's investigations.

I. ENVIRONMENTAL AUDIT

The purpose of Dames & Moore's Environmental Audit was to identify areas of potential environmental concern and to develop a plan to further investigate those areas. Based on our review of historical aerial photographs, site visits, interviews with Mack employees, and review of the available records, Dames & Moore recommended three programs:

- o Closure of Plant 5C
- o Removal of the underground storage tanks
- o Initiation of a study to evaluate potential environmental concerns identified at the site

Mack approved these three recommendations.

II. CLOSURE OF PLANT 5C

Dames & Moore developed a closure plan for Plant 5C, which was approved by the PADER. This work, including decontamination of machinery and removal of Resource Conservation and Recovery Act (RCRA) -regulated underground storage tanks (USTs), was successfully completed, and the PADER verbally approved the completed closure.

III. SOIL INVESTIGATIONS AND TREATMENT

SURFACE SOIL

The objective of the surface soil study was to determine whether polychlorinated biphenyl (PCB) -containing fluids had leaked from the on-site transformers onto the ground. Only one area (Boiler House - East) involved soils that contained PCBs at a concentration (7 ppm) significant enough to warrant excavation. This soil was removed. Dames & Moore's opinion is that no further action is warranted regarding PCBs in the soil near the transformers.

SUBSURFACE SOIL

Initially, Dames & Moore drilled 69 soil borings and analyzed selected soil samples for a modified suite (based on the Environmental Audit) of parameters from the United States Environmental Protection Agency (USEPA) Priority Pollutant list. The borings were located in areas of potential environmental concern identified during the Environmental Audit.

Soil from several borings in the eastern parking lot at Plant 5A contained elevated concentrations of metals. To further evaluate the lateral and vertical extent of the metals, Dames & Moore drilled an additional 40 borings and collected soil samples for analyses. The analytical results for these samples indicate that the soil below most of the Plant 5A East Parking Lot contains elevated levels of metals including lead, nickel, arsenic, chromium, copper, and cadmium. The metals are present from the ground surface to bedrock. However, based on Extraction Procedure Toxicity Test results and analytical results of the ground water beneath this area, the metals are relatively immobile. With the exception of the metals in the soil at Plant 5A, the only other contaminants detected at Mack were relatively low levels of metals and various organic compounds.

At this time, Dames & Moore believes that no further assessment or remedial action is needed with respect to the metals in the soil at Mack. We do recommend, however, that the area with elevated metals concentrations in the eastern parking lot of Plant 5A not be disturbed (other than for routine maintenance). Dames & Moore also recommends that the affected area be documented in the deed of sale, and that the future owner not disturb the area without Mack's prior approval.

UNDERGROUND STORAGE TANK REMOVAL AND RELATED SOIL INVESTIGATIONS

Dames & Moore decommissioned, removed, and disposed of USTs from 11 areas on-site. The soil that was contaminated based upon visual characteristics, photoionization detector (PID) readings, or odor was removed and treated. Soil samples were collected from the base and sidewalls of the excavations and from the soil stockpiles. Based on the results of the soil analyses, Dames & Moore's opinion is that eight of the former UST areas did not require additional action, and that only three areas did: UST 3; USTs 6, 7, and 27; and USTs 15 and 16. Remediation of the soil at UST 3 has been completed.

UST 3 was connected to a leaking gasoline dispenser. The contaminated soil in this area was removed to clean-up levels recommended by Dames & Moore. Based on the analytical results, Dames & Moore's opinion is that no further soil remediation in this area is necessary.

USTs 6, 7, and 27 were surrounded by soil containing volatile organic compounds (VOCs) and total petroleum hydrocarbons (TPH). Eighteen soil borings were drilled. Soil from the borings was analyzed to establish the horizontal and vertical extent of the contamination. Based on the analytical results, the soil contamination extends to bedrock. Dames & Moore has recommended a plan of action to remediate the soil contamination in this area by vacuum extraction.

Dames & Moore installed two monitoring wells (MT-9A and MT-10) to assess ground water quality near former USTs 6, 7, and 27. Monitoring well MT-10 contained 16 inches of free-phase product (gasoline) floating on the water table. Monitoring well MT-9A contained between 5 and 8 mg/l of dissolved VOCs that are characteristic of gasoline (predominantly benzene, toluene, xylenes, and ethylbenzene [BTX&E]). In addition, MT-9A contained 3.6 to 4.9 mg/l of trichloroethylene (TCE). The elevated levels of TCE were completely unexpected by Mack and Dames & Moore. Based on Dames & Moore's extensive search for the source of the TCE, Dames & Moore believes that the source of the TCE near USTs 6, 7, and 27 is localized near the Wash House or that the TCE coming onto Mack's property from an off-site source. Dames & Moore has recommended a plan of action to remove the free product and contaminated ground water (which includes the BTX&E and the TCE) in this area by air stripping.

USTs 15 and 16 were underlain by soil containing BTX&E and TPH contamination. Dames & Moore excavated most of the affected soil, performed 11 soil borings, and collected additional soil samples for analysis to evaluate the chemical quality of the remaining soil. These data indicate that the BTX&E and TPH contamination did not extend to bedrock.

In addition to the BTX&E levels, which were dominant at the northern end of the excavation, toluene and acetone were detected in the soil at the southern end of the former excavation.

Monitoring well MT-11 was installed hydrologically downgradient from former USTs 15 and 16. None of the VOC constituents of gasoline were detected in the ground water samples from this well. However, other VOCs were detected; most prevalent is TCE, at 210 ug/l. Dames & Moore has recommended a plan of action to remediate the soil in this area by vacuum extraction.

BIOLOGICAL SOIL TREATMENT

Dames & Moore treated approximately 1,360 cubic yards of soil on Mack's Plant 5C property. The contaminated soil, which was removed from the UST excavations, contained high levels of VOCs (as high as 219,000 ppm) and TPH (as high as 60,000 ppm). The PADER approved this remedial plan.

Since treatment began, the VOCs have decreased to acceptable concentrations and the TPH level has stabilized at concentrations ranging from 100 ppm to 480 ppm. Dames & Moore's opinion is that the treatment is complete and that the soil can be used on-site. A letter has been submitted to the PADER requesting their concurrence with this opinion.

IV. GROUND WATER INVESTIGATION

To evaluate ground water quality, Dames & Moore installed 25 monitoring wells. The ground water from the first six monitoring wells was analyzed for a modified suite of USEPA Priority Pollutants. VOCs were detected in concentrations of less than 100 ug/l in ground water samples from three of these six monitoring wells.

A total of 19 additional monitoring wells were installed during four subsequent investigative programs. The ground water from these monitoring wells was analyzed for selected USEPA Priority Pollutants or selected VOCs. Based on these data, two primary ground water contamination concerns have been identified: TCE and BTX&E (gasoline).

Other VOCs, mostly ketones and chlorinated alkanes and alkenes, were detected in the ground water at Mack. However, most of these VOCs were found in the same areas in which the high levels of TCE were detected. Thus, the proposed ground water treatment system near former USTs 6, 7, and 27 will remediate these additional VOCs in addition to the TCE and BTX&E in the treatment area.

While trichloroethylene was detected in ground water samples from 18 of the 25 on-site monitoring wells, Dames & Moore's opinion is that a ground water treatment system near former USTs 6, 7, and 27 will remediate the most concentrated portion of the TCE plume in that area. There appear to be at least two source areas for the TCE. The major source is located near Mack's western property boundary (near former USTs 6, 7, and 27), possibly off-site. The second source is located near former USTs 15 and 16. Dames & Moore performed extensive work to locate the eastern source, but it was not located.

A plume of free-phase gasoline and gasoline components dissolved in ground water was discovered near former USTs 6, 7, and 27. This plume has been partially delineated. Complete definition of the gasoline plume may require the installation of additional monitoring wells hydrogeologically downgradient and off-site of Mack's property.

V. CONCLUSIONS

Dames & Moore's scope of work was designed to detect and address the significant environmental concerns on Mack's property. Dames & Moore has identified two soil concerns and two ground water concerns, and has recommended action plans that are appropriate to remediate each area. Mack intends to address these concerns.

SOIL CONCERNS

Plant 5A East Parking Lot

High levels of metals are present in most of the soil in the Plant 5A East Parking Lot. However, leachability tests and ground water analyses indicate that these metals are not easily leachable. Dames & Moore's opinion is that no further action is warranted in the Plant 5A East Parking Lot. However, we do recommend that this affected area be documented in any deed of sale and that the future owner not disturb the area without Mack's and the PADER's prior approval.

Former USTs 15 and 16, and USTs 6, 7, and 27

The soil around these two former UST areas is contaminated with VOCs and TPH. The extent of the soil contamination is well documented. Dames & Moore recommends remediating the VOCs and lowering the TPH in the soil by vacuum extraction. A plan outlining the remedial action will be submitted to the PADER.

GROUND WATER CONCERNS

Gasoline

Gasoline is present in the ground water on the western side of the property. The tanks that were responsible for the gasoline (USTs 6, 7, and 27) have been removed. The gasoline in the ground water is present in a free phase and is dissolved in the ground water. The gasoline plume is fairly well defined on Mack's property, but the western (off-site) extent of the plume is unknown.

Mack intends to remediate the gasoline by removing the free product and removing the gasoline components (in conjunction with the TCE) using an air-stripping treatment system. A ground water remediation plan will be submitted to the PADER for approval.

TCE

There are high levels of TCE (28,000 ug/l) in the ground water on the western side of Mack's property near the Wash House. The source is unknown, and the presence of the TCE was unsuspected by Mack and Dames & Moore, based on the results of the background investigation and the extensive sampling that was previously performed. Lower levels of TCE are present beneath the northern half of Mack's property. The overall extent of the TCE plume is not known, but the plume is well defined on Mack's property, where the TCE concentrations are greatest (near the Wash House). There are relatively minor concentrations of TCE in the ground water beneath the buildings. In Dames & Moore's opinion, Mack's future remedial efforts will not affect business operations.

Extensive work has been completed to find the source, or sources, of the TCE. To date, no sources have been found. The main source of the TCE at Mack may be off-site.

Mack intends to use an air-stripping ground water treatment system for remediation. The treatment system will be installed in the Wash House area to pump and treat the ground water in order to remove the TCE, the gasoline components, and the other VOCs that have been detected in this area. Once this system is operational, the progress of treatment will be monitored, and, if necessary, modifications will be made. Mack will submit all remedial plans to the PADER for approval and will submit periodic progress reports.

VI. CLOSURE

Some of these issues have been discussed with the PADER. The others are scheduled for discussion on January 23, 1989. The objective of the discussions is to resolve all of the issues in compliance with the laws and regulations of the Commonwealth of Pennsylvania and to facilitate transfer of the property to new ownership.

Dames & Moore believes that the intended buyer can use the property without concern regarding Mack's future remedial efforts. The problems that Dames & Moore has identified can be remediated without inconveniencing the new owner.

This report was prepared for Mack Trucks, Inc. and the material in it reflects Dames & Moore's best judgement at the time of preparation and is accurate to the best of our knowledge. The resultant conclusions are action plans that are subject to the approval of PADER. Any use that a third party makes of this report, or any reliance on, or any decisions made based on it, are the responsibility of such third party. Dames & Moore accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made, or actions taken by a third party, based on this report.

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1.0 INTRODUCTION

1.1 GENERAL

During the past 18 months, Dames & Moore has collected 550 soil samples for a total of over 13,000 analyses and collected more than 70 ground water samples for a total of over 3,300 analyses. The main objective of this work was to thoroughly evaluate the environmental quality of the property, with the purpose of making the property ready for sale.

This report presents the results of these analyses and Dames & Moore's findings and conclusions for the work performed at Mack Trucks, Incorporated's (Mack) Assembly Division Plants 5A and 5C in Allentown, Pennsylvania. Dames & Moore's scope of work included:

1. Environmental Audit

2. Closure of Plant 5C

3. Assessment of Soil Quality

   - Surface Soil Study

   - Subsurface Soil Study

   - Soil Study Associated with the Underground Storage Tank Removal

   - Biological Soil Treatment

4. Assessment of Ground Water Quality

This report is comprised of six volumes. Volume I is organized into 12 chapters. Chapter 1 presents a general introduction, the plants' location, and the physiography of the area near the plants. Chapter 2 addresses background information, including site history, plant operations, and on-site facilities. The types of wastes generated and handled on-site and the waste water treatment system are also included in Chapter 2. Chapter 3 lists Dames & Moore's objectives for each of the four programs that were conducted and discusses the work that was completed in order to achieve those objectives.

The work that Dames & Moore has performed is described in Chapters 4, 5, 6, 7, and 8. Specifically, Chapter 4 presents the initial Environmental Audit, including a summary of our findings and recommendations. Chapter 5 discusses the closure of Plant 5C. Chapter 6 presents the results of Dames & Moore's assessment of soil quality on-site. This chapter is divided into four sections. The first section presents the surface soil study and the second section discusses the subsurface soil study. The third section discusses soil quality with respect to the underground storage tank (UST) removal program. The fourth section provides details of the biological soil treatment program.

Chapter 7 provides the assessment of ground water quality beneath the site. Chapter 8 briefly addresses the potential sources of TCE contamination. Chapter 9 discusses the potential receptors of the soil and ground water contamination beneath Mack's site. A summary of conclusions is presented in Chapter 10; Dames & Moore gives an overall assessment in Chapter 11. Finally, Chapter 12 offers closing statements. The tables and figures follow the text. Table 1 lists the acronyms used in this report.

The appendices are contained in Volumes II and III. Copies of the analytical data are provided as Volumes IV, V, and VI. These analytical data are summarized in the tables that accompany the text. Dames & Moore has emphasized specific analytical results in the text; however the reader must review the tables to thoroughly understand the analytical results.

1.2 PLANT LOCATION

Mack's assembly plant is located on the south side of Allentown, Pennsylvania, approximately 3/4 mile east of Little Lehigh Creek and 1 mile north of State Route 309, as shown in Figure 1. As shown in Figure 2, Mack's property, which is approximately 114 acres in area, is divided into two parcels: Plant 5A and Plant 5C.

Land in the immediate vicinity of the Mack plant is employed for industrial, commercial, and residential uses. As shown in Figure 3, the site is bounded on the east by Mack Boulevard and Dealer's Transit, Incorporated (Sober's) at the northeast corner of the property. Residences and apartments are found across Mack Boulevard, east of the plant.

The west side of the property is irregularly bordered by South Twelfth Street. Along this western border are properties owned by Allentown Commercial and Industrial Development Authority (Queen City Business Center) and the Allentown Outlet Mall. Currently, the Allentown Commercial and Industrial Development Authority is leasing to Exide. From 1984 to 1986, the property was owned by Black & Decker Company. Previously, General Electric manufactured small appliances on the site. The Allentown Outlet Mall was previously owned (1981 to 1985) by Messrs. Alan H. Sipp and George G. Sipp. From 1947 to 1981, the property was owned by Hutt-Wasseman Hat Corporation (a hat factory).

Dual Temp Oil Company (a fuel storage facility) and Saab Metals Corporation (a metal salvage yard) are found at the southwest corner of Mack's property. A map showing most of Mack's current commercial neighbors is provided as Figure 3.

Mack owns the land on the south side of the Assembly Plant. This property, which includes Mack's World Headquarters, is not part of the study area. There are residences along the northern margin of the Assembly Plant. As shown in Figure 2, a northeast-southwest-trending Conrail spur separates the Plant 5A property from the Plant 5C property.

1.3 PHYSIOGRAPHY

The City of Allentown lies in the Lehigh River valley. Blue Mountain is approximately 12 miles north of the city. South Mountain extends along the southern margin of Allentown. Mack's Assembly Plant rests on a low ridge that trends roughly north-south just north of South Mountain (Figure 1). Elevations at the Mack plant range between 300 and 350 feet above National Geodetic Vertical Datum.

The low ridge on which the plant rests is a drainage divide. The surface water that drains eastward flows into Trout Creek, and the surface water that drains westward flows into Little Lehigh Creek. Storm water run-off from the Assembly Plant also discharges to Trout Creek through a series of swales and underground pipes.

2.0 BACKGROUND INFORMATION

This chapter presents background information. Most of the information presented in this chapter is based on interviews with Mack employees or existing Mack records. Section 2.1 briefly describes the site history and plant operations. Section 2.2 describes the facilities, including exterior buildings, interior machinery, and underground storage tanks. Section 2.3 discusses the wastes generated at the Assembly Plant and Mack's waste-handling practices.

2.1 SITE HISTORY AND PLANT OPERATIONS

The Mack Trucks Assembly Plant was a warehouse and assembly complex for highway trucks of various sizes. The main plant consists of a number of adjoining buildings (Figure 2) that were constructed at different times. Additions were made to Plant 5C, which was constructed in 1925, in 1965 (Plant 5C Annex), 1969 (Plant 5F Building), 1974 (CKD [Complete Knock Down] Building), and 1976 (Small Parts Paint Building). The CKD Building was used to box complete unassembled trucks for shipment to consumers.

Mack began operating at this site in 1925 and 1926. Since that time, truck parts and assembled components were treated, prepared, and painted at Plant 5C. The trucks were assembled, inspected, and placed in various parking lots prior to shipment. In addition to truck assembly, operations at Plant 5C included spray painting and dip coating of metal parts. Truck performance was tested in the Dynamometer Building and on the steep testing hills on the south side of the property. The manufacturing operations did not greatly change over the years. Operations ceased in October 1987, and Plant 5C was properly closed in the spring of 1988.

The entire plant was powered by a coal-fired boilerhouse until 1981, when Mack converted from coal to oil.

2.2 FACILITIES

Mack's property is divided by a railroad right-of-way into the Plant 5A property and the Plant 5C property, as shown in Figure 2. A bridge connects the two plants.

As shown in Figure 4, at one time there was a total of 28 storage tanks on Mack's property; 3 contained hazardous waste. All of the underground storage tanks (USTs) have been properly removed. Table 2 is a list of the tanks.

2.2.1 Plant 5A

The Plant 5A property, which is roughly triangular, contains a Scale House, a small storage shed, and the Plant 5A Building. The Plant 5A Building was used to assemble and store truck tires. Since Mack ceased operations, the Plant 5A Building was sold and has been removed. The concrete slab foundation was still present at the time of this writing.

Five USTs are known to have existed on the Plant 5A property; they have been removed, as discussed in Section 6.3. The former locations of these tanks are shown in Figure 4. The size and content of each UST are listed in Table 2. The remainder of the Plant 5A property consists of three parking lots: the Plant 5A parking lot, the Plant 5C parking lot, and a small parking lot on the east side of the storage shed and Scale House.

2.2.2 Plant 5C

The Plant 5C property contains the Main Plant, or the Plant 5C Building, and four attached buildings: the Annex, the CKD Building, the Small Parts Paint Building, and the Plant 5F Building. The Boiler House lies northwest of the Plant 5C Building. The Dynamometer Building and a Wash House lie west of the Plant 5C Building. The Dynamometer Building was used to test trucks prior to sale. The Plant 5B parking lot lies north of the Plant 5C Complex. Near the southeast margin of this lot are a small storage shed and a drum storage area. The drum storage area was used for 90-day storage of drummed Resource Conservation and Recovery Act (RCRA) -regulated hazardous waste.

Eighteen USTs are known to have existed on the Plant 5C property. They have been removed, as discussed in Section 6.3. Former locations of these tanks are shown in Figure 4. The size and content of each tank are listed in Table 2.

Inside Plant 5C were large machines and booths used in truck painting and finishing operations. These booths and machines include ten paint booths, three sanding booths, a cab washer, a small parts washer, an electro-coat (E-coat) dip tank, a conventional dip tank, and the waste water treatment plant. These facilities have been cleaned (as discussed in Chapter 5) and removed. Currently, the Plant 5C complex is vacant.

2.3 WASTE TYPES AND WASTE-HANDLING PRACTICES

The hazardous materials present on Mack's property were primarily associated with truck painting or paint stripping of metal machinery. Some of the RCRA hazardous wastes were unused products, such as discarded paints and paint thinners. The rest were waste by-products, such as paint strippings and sludges. When production ceased, these substances were present in machines, storage tanks, and storage drums. These containers have been removed from the property.

According to Mack employees, an on-site area (behind the Plant 5C Annex and west of the former railroad tracks) was used before the early 1960s for disposal of boiler house ash, wood, and debris. This area was paved and then used as a parking lot.

Another area of potential past disposal exists under the Plant 5C Annex, which was built between 1970 and 1973. Plant 5C personnel reported that semi-solid paint sludges may have been disposed of at that location prior to 1970. No estimates were available of the quantity of wastes disposed of at either of these two on-site areas. Mack notified the United States Environmental Protection Agency (USEPA) of the existence of these on-site disposal areas through responses to a questionnaire sent to Mack by the USEPA.

2.3.1 Waste Water Treatment System

The waste water treatment plant was installed in 1977. Plant 5C discharged approximately 120,000 gallons per day of treated effluent to the City of Allentown publicly owned treatment works under City code limitations. This discharge was exempted from RCRA regulations through a "permit by rule." The effluent was monitored by the City of Allentown. In addition, Mack monitored the discharge on a quarterly basis.

Mack's waste water treatment sludge, which was generated at Plant 5C, was delisted by the PADER on July 14, 1986; the PADER considered it to be non-hazardous.

2.3.2 Hazardous Wastes

In general, Mack's hazardous wastes were caustic baths, solvents, and solvent baths. Waste paint was never delisted by Mack, and, therefore, was also treated as a hazardous waste.

2.3.2.1 Waste Solvent

Paint-cleaning wastes, principally waste solvent from cleaning spray-guns (waste gun-cleaner), are classified as hazardous under RCRA on the basis of ignitability. These wastes were collected from the paint booth mixing rooms and transferred to an 8,000-gallon UST (Table 2). Approximately 6,000 gallons of waste solvent were generated each 90-day period.

2.3.2.2 Paint and Lye Tank Scrapings

Other hazardous wastes generated by Mack included scrapings from the lye tank and scrap paints. These wastes were stored in 55-gallon drums. Approximately 50 partially filled drums were taken off-site every 90 days.

2.3.2.3 Paint-Booth Sludge

All waste paint sludge generated in the spray booths was collected and placed in a container outside the Small Parts Building. When the container was full of paint-booth sludge, it was picked up by Clements Brothers and hauled to Chem-Met in Wyandotte, Michigan.

3.0 OBJECTIVES

This chapter states the objectives for each of the four programs performed by Dames & Moore. Later in this report, a chapter is devoted to each of the programs. At the beginning of each of those chapters, our objectives are restated and the scope of work that was implemented to achieve the objectives is detailed.

3.1 ENVIRONMENTAL AUDIT

Our objectives were to:

- Develop a history of Mack's disposal practices.
- Prioritize on-site areas of potential environmental concern.
- Develop a Plan of Action to assess environmental conditions at the site.

3.2 CLOSURE OF PLANT 5C

Our objectives were to:

- Manage and document proper removal and decontamination of the three RCRA-regulated USTs.
- Manage and document decontamination of the waste-generating machinery inside Plant 5C.

3.3 ASSESSMENT OF SOIL QUALITY

Our objectives were to:

- Investigate soils in the areas of concern that were noted in the original Environmental Audit, and, if necessary based on the analytical results, propose additional tasks to further evaluate specific areas
- Remove the 19 non-RCRA-regulated USTs and their ancillary lines, and document soil quality around the USTs.
- Determine the extent of soil contamination, if any, around the USTs.
- Biologically treat the stockpiled soil derived from the UST removal.

3.4 ENVIRONMENTAL ASSESSMENT OF GROUND WATER

Our objectives were to:

- Determine the direction of ground water flow.
- Evaluate the quality of the ground water entering Mack's property.
- Evaluate the quality of the ground water exiting Mack's property.
- Identify the major ground water concerns (if any) associated with Mack's property.

4.0 ENVIRONMENTAL AUDIT

Dames & Moore performed an Environmental Audit for Mack in the spring of 1987. The objectives of the audit were to:

- Develop a history of Mack's disposal practices.
- Prioritize on-site areas of potential environmental concern.
- Develop a Plan of Action to assess environmental conditions at the site.

4.1 SCOPE OF WORK

To achieve the objectives, Dames & Moore:

- Reviewed records and literature.
- Interpreted historical aerial photographs.
- Examined surface conditions at the site.
- Presented our findings and recommendations to Mack.

4.2 LITERATURE AND RECORDS REVIEW

After conducting a preliminary site visit of the plant and its facilities, Dames & Moore collected and reviewed information provided by Mack. In addition, Dames & Moore collected relevant information from our files and other existing sources of information, such as state and United States Geological Survey (USGS) publications and maps in order to compile baseline topographic, hydrogeologic, and geologic information.

4.3 HISTORICAL AERIAL PHOTOGRAPH INTERPRETATION

Historical aerial photographs were obtained and interpreted in order to identify and define areas of potential environmental concern. Dames & Moore obtained and interpreted four vintages of stereographic pairs of aerial photographs:

- June 22, 1947
- October 6, 1958
- June 17, 1964
- July 18, 1971

For each set of photographs, the areas that involved evidence of disturbed surface soil were transferred to base maps. These maps are included in this report as Figures 5, 6, 7, and 8. These four figures were used to generate a map (Figure 9), which shows a composite of the areas of surface soil disturbance for all four interpretations.

Since June 1, 1988, Dames & Moore acquired eight additional vintages of stereographic aerial photographs:

- March 21, 1938
- April 23, 1939 (single glossy image)
- March 6, 1964
- March 24, 1964
- April 4, 1964
- November 4, 1967
- October 8, 1974
- May 8, 1981

These photographs were also interpreted and generally support Dames & Moore's interpretations of the areas of potential concern shown on the composite map (Figure 9); however, since they generally duplicated the areas shown on the composite map, we did not generate additional maps from these photographs.

4.4 SITE VISIT AND INTERVIEWS

After reviewing the pertinent literature and the aerial photographs, Dames & Moore visited the site. On April 9, 1987, Dames & Moore interviewed Mack management and plant personnel. Questions focused on ascertaining the origin of the disturbed surface soils shown on our composite map (Figure 9). The anomalies on Figure 9 are labeled based on the answers to these questions. We walked the grounds to field check the aerial photographic interpretations. However, all of the identified areas are under buildings or asphalt.

During the visit, the interiors of Plants 5A and 5C were toured and the plant processes were observed. Dames & Moore did not review air emissions permits or any air quality data.

4.5 RECOMMENDATIONS

Based on the Environmental Audit, Dames & Moore recommended that Mack undertake three programs:

1. Closure of Plant 5C (Chapter 5).

2. Identification and evaluation of the environmental concerns at the site.

3. Removal of the USTs (Section 6.3).

Mack approved these recommendations, and the remainder of this report documents these three programs.

5.0 CLOSURE OF PLANT 5C

A Closure Plan for Plant 5C, dated August 22, 1988, was developed by Dames & Moore and submitted to the PADER, which approved the plan. The Closure Plan is included as Appendix A.

5.1 OBJECTIVES

Our objectives were to:

- Manage and document proper removal and decontamination of the three RCRA-regulated USTs.
- Manage and document decontamination of the waste-generating machinery inside Plant 5C.

5.2 SCOPE OF WORK

To accomplish the objectives, Dames & Moore:

- Prepared a PADER-approved Closure Plan.
- Prepared bidder's contract documents for the closure of areas where RCRA hazardous waste was generated or stored inside Plant 5C.
- Prepared bidder's contract documents for the closure of three USTs containing RCRA-regulated hazardous waste and hazardous substances.
- Assisted in the selection of the contractors to close Plant 5C.
- Provided resident engineering services during the closure of Plant 5C.
- Performed an investigation to evaluate the present condition of former PCB electrical transformer areas.

5.3 CLOSURE PLAN

The Closure Plan for Plant 5C (Appendix A) covers closure of areas inside and outside of Plant 5C where RCRA-regulated hazardous waste was generated or stored. Specifically, the Closure Plan addressed these areas:

A. Areas inside Plant 5C

Paint Booths:

Light-Line Chassis
Heavy-Line Chassis
Hood
Cab Color
Cab Prime

Multi-Tone
New Final
Old Final
Small Parts Prime
Small Parts Color

Small Parts Washer

Lye Tanks

Process Lines Leading to Waste Water Treatment System

Electro-Coat Dip Tank

Waste Water Treatment System

B. RCRA-Regulated USTs

Underground Virgin Solvent Tank

Underground Waste Solvent Tank

Emergency Paint Overflow Tank

C. PCB Investigation

D. Drum Removal

The machines inside the plant were properly cleaned, and rinse water samples were collected to document the quality of the cleaning. The former locations of the machines are shown in Figure 10. The procedures and analytical results will be submitted to the PADER under separate cover.

The PCBs investigation is described in Sections 6.1 and 6.2 of this report. The RCRA-regulated USTs are discussed in Section 6.3 of this report. Dames & Moore was not responsible for removal of the drums from the site. B&P Environmental Services, Inc. (B&P Environmental) of Oakland, New Jersey, was retained by Mack to remove the drums of hazardous waste and paint cans, solvent cans, and other small containers of hazardous substances.

5.4 ITEMS NOT INCLUDED IN CLOSURE PLAN

Four areas inside Plant 5C, which were not included in the PADER-approved Closure Plan, were cleaned and decontaminated. These areas are:

- The conventional dip tank in the small parts dip room.
- The aboveground E-coat storage tank adjacent to the small parts dip room.
- The cab washer and underground make-up tanks.

- The battery-charging room.

These items were not included in the Closure Plan because no RCRA hazardous waste was generated at these locations. These items were cleaned and decontaminated by B.E.S. Environmental Specialists, Inc. of Larksville, Pennsylvania, under the same contract for closure of the items specified in the Closure Plan.

6.0 ASSESSMENT OF SOIL QUALITY

This chapter is divided into four sections. Section 6.1 discusses the surface soil sampling program. Section 6.2 discusses the soil borings, unless they are associated with the UST removal. Section 6.3 documents the UST removal and discusses all soil samples collected during removal and taken from the borings that were drilled to further investigate three of the former UST areas. Section 6.4 discusses the biological treatment of the soil that was removed during the UST program.

6.1 SURFACE SOIL PCBs STUDY

Seventeen surface soil samples were collected on August 5, 1987. The objective of collecting these samples was to evaluate the impact, if any, of the PCB-bearing transformers on the surficial soil. These soil samples were collected from a depth of 0 to 6 inches near the former locations of the PCB-containing transformers. Dames & Moore's field procedures are described in Appendix B. The soil sampling procedures are contained in in Appendix B-1.

The locations of the five areas that were investigated are shown in Figure 11 and are described in this section. The areas include the Dynamometer Building, Boiler House - West, Boiler House - East, old Plant 5A transformers, and the Main Bank. The actual locations of the soil samples were selected in the field, and depended upon field observations such as surface stains, vegetative stress, and the direction of surface water run-off. A summary of the analytical results is presented in Table 3.

6.1.1 Dynamometer Building

The Dynamometer Building was used for performance testing of assembled trucks. On the outside of the north-facing wall of the Dynamometer Building is a fenced-off transformer. As shown in Figure 12, two surface soil samples were collected near the transformer. The analytical results (Table 3) did not reveal any PCBs; therefore, we recommend no further action with respect to PCBs in this area.

6.1.2 Boiler House - West

Five soil samples were collected near the transformers on the west side of the Boiler House. Samples BHW-1 and BHW-2 were collected beneath the transformer drains. Soil sample BHW-3 was collected next to the cement platform. BHW-4 is a composite sample of the two locations.

Surface water run-off drains from the transformer area into the basement door of the Boiler House. A wedge of sediment has been deposited inside the door. A composite soil sample (BHW-5) was collected from this wedge of sediment. The locations of these five soil samples are shown in Figure 13.

The analytical results (Table 3) indicate that two of the five samples contained low levels of Arochlor 1260. BHW-2 contained 0.51 part per million (ppm), and BHW-5 contained 0.8 ppm. No further action is recommended for this area.

6.1.3 Boiler House - East

Two soil samples were collected near the four transformers on the east side of the Boiler House. Sample BHE-1 was collected from the black soil around the base of the eastern transformer. Sample BHE-2 was taken from beneath the transformer's drain. The locations of these soil samples are shown in Figure 14.

The analytical results indicate that BHE-1 contained 7 ppm of PCBs and that BHE-2 contained 0.47 ppm of PCBs. Based on the analytical results, Dames & Moore excavated approximately 2 cubic yards of the oil-stained soil around the base of the transformer on February 25, 1988. The soil was stockpiled on, and covered with plastic in the paved area east of the Boiler House. Three soil samples were collected from the base of the excavation. The locations of the samples are shown on Figure 14. The soil samples were analyzed for PCBs. The results shown in Table 3 indicate that none of the samples contained PCBs above the laboratory's minimum detection level (0.33 ppm.). The excavated area at the base of the transformer, which is shown in Figure 14, was backfilled to grade with crushed stone. On March 30, 1988, the stockpiled contaminated soil was placed in four 55-gallon drums. The drums were sealed and labelled. Dames & Moore's opinion is that no further action is needed in this area.

6.1.4 Old Plant 5A Transformers

There were six old transformers in the Plant 5A Parking Lot. They were removed from the upper southeast exterior corner of the Plant 5A Building. There were no stains on the pavement below the former transformer locations; therefore, no soil samples were collected. However, we did collect two samples (OT-1 and OT-2) from near the area where these six transformers were stored. The locations of the two soil samples are shown in Figure 15.

The analytical results (Table 3) indicate that PCBs were not present at detectable levels. Therefore, no further action is recommended in this area.

6.1.5 Main Bank

The Main Bank is on the south side of the Mack property. It consists of six transformers that rest on a gravel pad. The gravel pad is 6 to 8 inches thick. Dames & Moore collected six surface soil samples in order to evaluate the quality of the soil near the transformers. The locations of the six soil samples are shown in Figure 16.

Five of the soil samples, designated MB-1 through MB-5, were collected from inside the fence that surrounds the Main Bank. Soil sample MB-4 was collected from beneath the southern margin of the gravel pad. MB-1 was collected from the northern edge of the Main Bank, where drums of transformer fluid were formerly stored. MB-2 and MB-3 were taken near the western transformers. Soil sample MB-5 was a composite sample of soil from below the drains of the three easternmost transformers.

Sample MB-6 was collected from just off the western margin of the parking lot. Mack removed three old transformers from the Main Bank and temporarily stored them on the asphalt. There were stains on the asphalt. Surface water run-off drains from the stained area to the location of soil sample MB-6.

The analytical results (Table 3) indicate that none of the samples (MB-1 through MB-5) collected from inside the Main Bank contained PCBs at detectable levels. Soil Sample MB-6 did contain 2.23 ppm of PCB 1260. Based on these data, Dames & Moore believes that no further action is warranted with regard to PCBs near the Main Bank.

6.2 SUBSURFACE SOIL STUDY

Dames & Moore's objective was to investigate the areas of concern that were noted in our original Environmental Audit, and, if necessary based on the analytical results, to propose additional tasks to further evaluate specific areas. This study was designed to identify areas of potential major environmental concern.

Dames & Moore initially drilled 69 soil borings and analyzed the soil for a modified suite of USEPA Priority Pollutants (based on the Environmental Audit). The results of these borings are discussed in subsection 6.2.1.

Based on the results of our initial subsurface soil investigation, we recommended that 40 additional borings be drilled on the Plant 5A property. These additional borings and the analytical results are discussed in subsection 6.2.2. In addition, 42 soil borings were drilled to investigate the UST areas; these borings are discussed with the UST removal and investigative program.

6.2.1 Soil Borings, Soil Sampling, Laboratory Analyses, and Analytical Results

Initially, Dames & Moore drilled 69 borings at Plants 5A and 5C from July 20 to August 5, 1987. As shown on Figure 17, the locations of these borings were based primarily on interpretation of the historical aerial photographs referenced in the Environmental Audit. The borings were drilled from the ground surface to refusal. Continuous split-spoon soil samples were collected and described. Each split-spoon soil sample was screened in the field with a photoionization detector (PID).

Boring logs showing the soil descriptions and the PID readings are contained in Appendix C-1. The field procedures are included in Appendix B-2.

Since our objective was to identify only those areas of significant environmental concern, soil from several borings was composited. The linear feet of soil that was composited is shown with the analytical date on the summary table for each area.

The soil was analyzed for a modified suite of Priority Pollutants comprised of base/neutral-extractable organic compounds plus 15 additional non-Priority Pollutant base/neutral compounds (B/Ns+15), total phenols, total cyanide, PCBs, and Priority Pollutant metals. Because there are no known records of Mack using acid-extractable compounds, total phenols analysis was run in lieu of acid-extractable organic compounds. Since pesticides were not used at Mack, they were not tested for in the soil. Based on PID screening, selected soil samples were analyzed for volatile organic compounds plus 15 additional compounds (VOCs+15). A summary of the analytical results is compiled in Tables 4 through 13.

Arsenic levels throughout the site generally range between 10 and 50 ppm. In this study, the off-site "background sample" contained 15 ppm of arsenic. Total phenols were detected in the soil at various locations on the Plant 5A and 5C properties. Concentrations of total phenols ranged from less than detectable (50 ppm) to a maximum of 109 ppm. For the purposes of this investigation, these levels of arsenic and phenols are considered to be background levels for the Mack site.

The Allentown Assembly Plant, which includes Plants 5A and 5C, has been divided into nine areas, designated A through I. These nine divisions and the boring locations, which are shown on Figure 17, are based on the generic and operational differences in each area; their sole purpose is to facilitate data management. Each area is individually discussed.

6.2.1.1 Area A - North Storage Area

The North Storage Area was a holding area for discarded industrial equipment and, until very recently, was a parking lot for tractor-trailers. The aerial photograph of 1958 (Figure 6) indicates a large disturbed zone that roughly parallels the railroad tracks. According to Mack, bottom ash from the Boiler House was used to fill the topographic lows.

An overgrown area in the northeast corner of Area A was used to store industrial equipment such as signs, shelving, sheets of metal, and storage tanks. Due to the overgrowth, Dames & Moore bulldozed the area to allow the drill rig into the eastern end of Area A.

The six borings that Dames & Moore drilled in Area A were designated A-1 through A-6 and are shown in Figure 17. The purpose of these borings was to evaluate the nature of this disturbed zone and the surrounding area. A summary of the analytical results is included in Table 4.

Because no VOCs were registered by the PID, no VOC samples were collected from Area A. No PCBs were detected in the five soil samples submitted for PCB analysis from Area A. However, there were low levels of B/Ns+15. Total phenols were detected.

The soil from Area A was also analyzed for metals and total cyanide. Cyanide was detected at trace levels ranging from 0.10 ppm to 0.82 ppm. Borings A-1, A-2, and A-3 contained lead concentrations ranging from 250 ppm to 382 ppm. The soil from A-4 contained 10,375 ppm of lead. At this location, there were also elevated levels of cadmium (62.3 ppm), chromium (254 ppm), copper (6,947 ppm), nickel (826 ppm), and zinc (7,180 ppm).

Based on these analytical results, Dames & Moore recommended that additional borings, soil sampling, and analyses be performed in Area A to define the lateral and vertical extent of the metals contamination at Plant 5A. Mack approved this study. The results of this program are discussed in subsection 6.2.2.

6.2.1.2 Area B - North Parking Lot

As shown in the historical aerial photographs, Area B is located in the northeast corner of the property. The area was mostly used as a parking lot. The eastern side of the parking lot was used for storage of corrugated metal basins and wooden pallets. In addition, 55-gallon drums of waste were stored in Stockroom 90. Fourteen borings, designated B-1 through B-14, were drilled in order to evaluate Area B.

In this report, Area B is divided into two zones. One zone is the area in the northeast corner of the property near Sober's property, and the other is the area beneath the central parking lot (Central Area).

6.2.1.2.1 Sober's Property

Three borings were drilled adjacent to Sober's property. Their purpose was to evaluate the effect, if any, that Sober's property may have had on Mack's property. These borings are designated B-2, B-3, and B-8. A summary of the analytical results is presented in Table 5.

The soil from B-2, B-3, and B-8 contained trace levels of bis(2-ethylhexyl)phthalate (1.2 ppm maximum) and di-n-butyl phthalate (1.7 ppm maximum). Total phenols were detected in composite soil sample B-2/B-3. No phenols were detected in B-8. No PCBs were detected in the soil near Sober's property. The VOC

analysis of B-8 indicates that 0.08 ppm of chloroform was present. Based on the available data, there appear to be no significant quantities of organics in the soil near Sober's property.

Cyanide was not detected in these two soil samples. The Priority Pollutant metals analyses did detect metals above background concentrations. However, Dames & Moore's opinion is that none of the levels of metals warranted additional investigations.

6.2.1.2.2 Central Area

The Plant 5B East Parking Lot is currently covered with asphalt. However, aerial photographs indicate several distinct zones of prior soil disturbance in this area. According to former Mack employees, these zones may represent bottom ash from the Boiler House. Eleven borings were drilled to evaluate the soil quality in this area. The borings in Area B are described in numerical order. The summary of the analytical results is presented in Table 5.

No VOCs were detected in the three soil samples from the Central Area that were analyzed for VOCs+15 (B-1, B-4, and B-11). Low levels of B/Ns were detected. Total phenols were detected in five of the nine soil samples from the Central Area. The analyses for PCBs detected only one positive reading (0.48 ppm.) Based on these analytical results, there appears to be no significant environmental concern associated with organic compounds in the Central Area of Area B.

Cyanide was not detected in any of the nine samples from the Central Area. The metals analytical results were all relatively low. Based on the analytical data, Dames & Moore recommended that no additional actions in Area B.

6.2.1.3 Area C - Truck Storage Area

As shown in the historical aerial photographs, the truck storage area was in the northwest corner of the plant. The oldest aerial photographs reviewed, which date from 1947 (Figure 5), indicate that this area was used to store trucks. Two small anomalous areas were noted within Area C, and numerous anomalous areas were noted along Mack's southern property boundary in Area C adjacent to the Queen City Business Center.

As shown in Figure 17, eight borings were drilled in Area C. A summary of the analytical results is found in Table 6.

6.2.1.3.1 Two Anomalous Areas

Borings C-1 and C-2 are on the northern side of the Scale House. C-1 was completed to a depth of 2.9 feet. The soil was analyzed for B/Ns+15, phenols, metals, and cyanide. Soil from C-1 was composited with soil from C-2 and analyzed for PCBs.

Boring C-2 was located in the southwestern corner of the parking lot. The depth to bedrock was 12.2 feet. The soil from the C-1/C-2 composite sample was analyzed for B/Ns+15, phenols, metals, and cyanide.

No PID readings were registered in the field, so there are no VOC analyses for C-1 or C-2. Trace concentrations of B/Ns+15 and PCBs were detected. Total phenols were detected.

Cyanide was not detected. However, elevated levels of metals were detected. Boring C-2 contained 1,370 ppm of lead. In addition, C-2 contained elevated levels of cadmium (13.9 ppm) and zinc (854 ppm).

Based on these analytical results, Dames & Moore recommended additional borings, soil sampling, and analyses for metals in this section of Area C in conjunction with the further investigation in Area A. Mack approved the additional work, and this study is discussed in subsection 6.2.2.

6.2.1.3.2 Mack's Property Boundary

Borings C-6 and C-7 were drilled along Mack's southern property boundary in Area C, as shown in Figure 17. Trace levels of B/Ns+15 were detected near Mack's property boundary. Boring C-6 contained 55.5 ppm of phenols. C-4 did not contain detectable levels of phenols. No PCBs were detected in the C-6/C-7 sample.

Cyanide was not detected in either sample. Based on the analytical data, Dames & Moore's opinion is that no further action with regard to soil is needed in this area.

6.2.1.3.3 Undisturbed Area

Borings C-3, C-4, C-5, and C-8 were drilled in areas of no known disturbances. The purpose of these borings was to further characterize the Plant 5A Parking Lot. The locations of these four borings are shown on Figure 17.

Boring C-3 had PID readings as high as 50 units; therefore, one VOCs+15 analysis was requested. This sample was composited from soil collected from 4 to 12 feet and from 14 to 15 feet. No VOCs were detected in this sample. Trace levels of B/Ns+15 were detected. PCBs were not detected in any of these four soil samples. Phenols were detected. Cyanide was not detected in these four borings, and no significant quantities of metals were detected.

Based on the available analytical data, Dames & Moore's opinion is that no further action is necessary with regard to soil in the Plant 5A Parking Lot.

6.2.1.4 Area D - Coal Storage Area

As shown in Figure 17, Area D had been used to store coal for use in the Boiler House since the plant first opened. All of the historical aerial photographs reviewed show a large pile of coal in Area D. In August 1977, berms with internal drainage were built around the coal pile to contain surface run-off water. In June 1978, when the coal-fired boilers were converted to No. 6 fuel oil, the coal was sold and the area was paved.

To evaluate the coal storage area, two soil borings were performed (designated D-1 and D-2). In addition, a third boring, designated D-3, was performed on the east side of the Dynamometer Building. Composite soil samples from borings D-1 and D-2 were analyzed for B/Ns, phenols, PCBs, metals, and cyanide. The soil from D-3 was analyzed for the same parameters.

As shown in Table 7, phenols and trace levels of B/Ns+15 compounds were detected in both soil samples. No PCBs were detected. No cyanide was detected in either sample. All of the metals detected occurred at relatively low levels.

Based upon these analytical results, Dames & Moore's opinion was that no further action with regard to the soil is warranted in Area D.

6.2.1.5 Area E - Annex and Plant 5C

Based on the historical aerial photographs, Area E contains numerous surface disturbances, as shown in Figure 17. The size of the anomalous areas varied through the years. According to Mack, the surface disturbances were caused by deposits of cinders, reducer, paint sludge, wood treatment waste, garbage, and miscellaneous solid waste.

Nineteen borings were completed in Area E in order to evaluate soil quality. Eight borings were located outside the building and are discussed in subsection 6.2.1.5.1. Eleven borings were drilled through the floor of the Plant 5C Annex and Plant 5C Building, and are discussed in subsection 6.2.1.5.2. The borings in this area were divided into two groups: an eastern group, which lies mainly outside of the Annex building, and a western group, which lies beneath the Annex and Building 5C.

6.2.1.5.1 Exterior Borings

Eight borings were drilled to evaluate the past disposal area that is not under buildings. The borings are designated E-1 through E-8. A summary of the analytical results is found in Table 8.

One soil sample, E-3, was analyzed for VOCs. None were detected. Total Priority Pollutant B/Ns ranged from 1.9 ppm to 8.3 ppm. All of the soil in this area contained relatively low levels of phthalates. Only one soil sample contained detectable phenols. No PCBs were detected. No cyanide was detected. No metals were detected at levels that warranted additional investigations.

Based on the analytical results derived from this boring program, there appear to be no significant environmental concerns associated with the soil. However, during the UST removal and soil investigation, VOCs were detected just north of the study area near USTs 15 and 16. These VOCs are discussed in subsection 6.3.12.

6.2.1.5.2 Interior Borings

Eleven borings were drilled through the 4-inch concrete slab of the plant floor: four in the Annex and seven in Plant 5C. A summary of the analytical results is contained in Table 9.

Based on PID field analyses of all 11 borings, only one soil sample (from boring E-15) was submitted for laboratory analysis. No VOCs were detected in this sample. Trace concentrations of B/Ns (mostly phthalates) were detected in most of the borings inside the building. Total phenols were detected. PCBs were detected in the soil beneath the building in trace concentrations.

The soil from these 11 borings was also analyzed for metals and total cyanide. The only sample that contained a detectable level of cyanide was E-9, which contained a concentration of 0.70 ppm. Relatively low levels of metals were detected in the soil beneath the building.

Based on these analytical results, Dames & Moore's opinion is that additional actions with regard to soil are not warranted beneath the Plant 5C Building or the Plant 5C Annex.

6.2.1.6 Area F - Small-Parts Paint Building

The potential environmental concerns identified from the historic aerial photographs at Area F are almost entirely beneath the Small-Parts Paint Building. Seven borings were drilled in Area F: two exterior borings (F-1 and F-2) and five interior borings (F-3 through F-7). The soil was analyzed for B/Ns+15, phenols, PCBs, metals, and cyanide. A summary of the analytical results is found in Table 10.

In Area F, no VOCs were detected in the field using the PID; therefore, none of the soil samples were analyzed for VOCs. Trace levels (1.6 and 1.7 ppm) of di-n-butyl phthalate were detected in borings F-4 and F-5. Total phenols were detected.

The seven soil borings in Area F were also analyzed for Priority Pollutant metals and cyanide. The concentration of the metals is relatively low. No cyanide was detected.

Based on these analytical results, Dames & Moore recommends no additional soil investigations in Area F.

6.2.1.7 Area G - South Parking Area

Four disturbed areas were identified in the aerial photographs of Area G. The three southernmost areas are believed to represent a man-made hill used to test truck capabilities. Eight borings were performed to evaluate the nature of the compounds present, if any, in Area G. The borings are designated G-1 through G-8. Boring G-5 encountered refusal on three attempts. Only dolomite bedrock was found to directly underlie 1 foot of macadam, so no soil samples were collected.

The laboratory analyses performed on the soil samples were B/Ns+15, phenols, PCBs, metals, and cyanide. A summary of the analytical results is presented in Table 11.

Only one soil sample from boring G-8 was analyzed for VOCs. Trace levels of phthalates were detected in the B/N analysis. No VOCs, phenols, or PCBs were detected. The cyanide and metals analyses detected only relatively low levels.

Based on these analytical results, Dames & Moore's opinion is that no further action with regard to soil is warranted in Area G.

6.2.1.8 Area H - Southwest Parking Area

As noted in the 1971 aerial photograph, Area H has one large east-west-trending anomalous area. This anomaly may be a construction scar from the installation of the powerlines. Three borings, labeled H-1, H-2, and H-3, were drilled in Area H to evaluate this anomaly.

Due to inaccurate maps, borings H-1, H-2, and H-3 did not address the area that we noted in Area H through the use of historical aerial photographs; therefore, Dames & Moore drilled three additional borings (designated H-1A, H-2A, and H-3A). The locations of all six borings are shown in Figure 17.

One soil sample was composited from the first set of borings (H-1, H-2, H-3) and one was composited from the second set of borings (H-1A, H-2A, and H-3A). The soil samples were analyzed for a modified list of USEPA Priority Pollutants. A summary of the analytical results is presented in Table 12.

The soil in Area H ranged in thickness from 0.8 to 5.1 feet. No visual signs of contamination were observed in any of the six borings.

One soil sample, the composite from borings H-1A, H-2A and H-3A, was analyzed for VOCs. None were detected. The only B/N detected in the composite sample from the first three borings (H-1, H-2, and H-3) was a trace concentration of di-n-butyl phthalate. However, the composite soil sample from borings H-1A, H-2A, and H-3A contained a total of 58.8 ppm of B/Ns. As shown in Table 12, ten B/N compounds were detected at levels ranging from 1.8 ppm to 10.1 ppm (fluoranthene). Although the B/N concentrations are slightly elevated, there were no visual signs of contamination and the native soil horizon is relatively thin. Furthermore, since B/Ns are not easily mobilized, Dames & Moore did not recommend further action at this time.

6.2.1.9 Area I - World Headquarters

One boring was drilled on Mack's property south of the study area. The purpose of this boring was to establish background levels for the investigation.

This boring was designated I-1, and was drilled to a depth of 19.3 feet. Neither bedrock nor water was reached. One composite soil sample was collected and submitted for analysis. The laboratory analyses performed were B/Ns+15, phenols, PCBs, metals, and cyanide. A summary of the analytical results is contained in Table 13.

In soil sample (I-1), the only B/N detected was di-n-butyl-phthalate (1.13 ppm). Neither phenols, PCBs, nor cyanide were detected. The laboratory detection level for these compounds are phenols, 50 ppm; PCBs, 1.5 ppm; and cyanide, 0.5 ppm. Five metals were detected: arsenic (15.1 ppm), chromium (17.5 ppm), copper (22.3 ppm), nickel (24.3 ppm), and zinc (58.9 ppm). Since this property had never been used for industrial purposes, these levels are considered to represent background levels for the investigation.

6.2.2 Plant 5A - East Parking Lot

The analytical results from the soil testing indicate that elevated levels of metals are present in the eastern parking lot of Plant 5A. Based on our evaluation of the analytical data from the (Areas A and C) (see subsections 6.2.1.1 and 6.2.1.3), Dames & Moore drilled an additional 40 soil borings at Plant 5A between April 12 and 22, 1988. The purpose of these additional borings was to further evaluate the horizontal and vertical extent of the elevated concentrations of metals in the soil in the Plant 5A East Parking Lot. The 121 soil samples that were collected from the 40 borings were analyzed for Priority Pollutant metals. Each boring was sampled from 0 to 2.5 feet, 2.5 to 5.0 feet, 5.0 to 10.0 feet, and every 5 feet thereafter until bedrock was reached. All samples were field-screened for VOCs with a PID. The boring logs, which include the PID readings, are included as Appendix C-2. The locations of these additional borings are shown in Figure 18.

The analytical results and this section are subdivided into three subsections: VOCs, metals, and the Hazardous Waste Characteristic Tests. Two brief subsections on the volume of affected soil and the ground water quality beneath the Plant 5A East Parking Lot are provided, followed by a summary.

6.2.2.1 Volatile Organic Compounds

Based on the PID readings, one soil sample was analyzed for VOCs. That soil sample, which was collected from boring BB-6, registered 90 units on the PID. The sample was composited from a depth of 10 to 15 feet. Ten other borings contained soil that registered from 10 to 40 PID units.

The VOC analyses on the soil from BB-6 indicate that it contains a total of 339 ppb of total VOCs. As shown on Table 15, seven compounds were detected. Toluene was detected in the highest concentration (0.117 ppm). In addition, the laboratory analyses detected ethylbenzene (0.096 ppm), TCE (0.055 ppm), 1,1,1-trichloroethane (0.035 ppm), tetrachloroethylene (0.016 ppm), 1,1-dichloroethylene (0.011 ppm), and 1,1-dichloroethane (0.009 ppm).

The soil sample from BB-6 represents the sample with the highest VOCs indicated by our field investigation. Dames & Moore's opinion is that additional investigations with respect to VOCs in the soil are not warranted in this area.

6.2.2.2 Metals

As shown in Table 14, elevated levels of arsenic, cadmium, chromium, copper, lead, and nickel are present in most of Areas A and C. In addition, the elevated concentrations are present at all depths, from the ground surface to bedrock.

In general, the peak levels of these metals appear to be concentrated in two areas: one in the western half of the parking area (near boring BB-18) just north of the base of the bridge embankment, and the other in the northeast corner of the storage area (near boring BB-2).

Cross sections constructed along A-A' show the concentrations of arsenic, cadmium, copper, chromium, nickel, and lead in the soil. The concentrations of the other metals are not shown on cross sections, but the analytical results are contained in Table 14. The line of section is shown in Figures 18 and 19.

Figure 20 is a cross section that shows lead concentrations through these two areas. This cross section shows that these concentrations are two distinct pods containing elevated levels of lead in the soil. Both pods are roughly horizontal. The southwestern pod is centered around boring BB-19, with the greatest lead concentration (8,360 ppm) at a

depth of 5 to 10 feet. The northeastern pod of lead also involves the highest concentrations at a depth of 5 to 10 feet, but the maximum concentration of lead in this area (8,400 ppm) was found in boring BB-2, between a depth of 2.5 and 5 feet.

The cross sections for copper (Figure 21), nickel (Figure 22), and cadmium (Figure 23) show the same general geometries as lead. The maximum concentrations of metals occur in the same general areas as the elevated lead concentrations.

The cross section for chromium (Figure 24) shows the same horizontal configuration of high concentrations near the southwestern pod. The northeastern pod (near BB-6) exhibits a subvertical trend. Arsenic (Figure 25) has a similar configuration as chromium near the northwestern pod, but the southwestern area also has a somewhat erratic, vertically trending configuration.

6.2.2.3 RCRA Hazardous Waste Characteristic Tests

Based on the elevated metal concentrations shown in Table 14, Dames & Moore analyzed five of the soil samples for leachability by the Extraction Procedure Toxicity Method. The analytical results (Table 16) show that the metals are not easily leachable. However, Mack requested that 14 additional soil samples be analyzed for Extraction Procedure Toxicity to ensure that the results were truly representative.

Thus, based on the metals concentrations shown in Table 17, 14 soil samples were submitted for RCRA Hazardous Waste Characteristic Tests (EP Toxicity, Ignitability, Reactivity, and Corrosivity). The 14 soil samples were chosen from areas of highest metals contamination. In general, Dames & Moore submitted the soil from the stratigraphic interval with the greatest concentration of a specific metal, or from the soil between the bedrock and a zone of high metals concentration.

A summary of the second round of EP Toxicity results is included as Table 17. None of these 14 soil samples exceeded the allowable maximum levels established by the USEPA for EP Toxicity leachate metals. All 14 soil samples were found to be non-reactive, non-corrosive, and non-ignitable. Thus, based on the RCRA Hazardous Waste Characteristic Tests, the soil in the Plant 5A East Parking Lot is not a RCRA hazardous waste.

6.2.2.4 Volume of Soil

Based on the depth of refusal for the borings in the Plant 5A Parking Lot, a bedrock elevation map was constructed (Figure 26). This map shows that the bedrock beneath the parking lot is an irregular surface.

A soil isopach map was also generated, and is shown as Figure 27. Using this isopach map, and the areal extent of the metals contamination, Dames & Moore calculated that 120,000 to 140,000 cubic yards of soil containing elevated levels of metals are present in the Plant 5A East Parking Lot.

6.2.2.5 Ground Water (Plant 5A East Parking Lot)

As a further precaution, two additional monitoring wells (MT-7 and MT-12) were installed in the Plant 5A East Parking Lot (MT-1 was previously installed) to ascertain the possible impact of the metals in the soil upon the ground water. Monitoring well MT-7 is downgradient of the highest concentration of metals and well MT-12 is screened beneath the area with the highest metals concentration (in a bedrock low). MT-1 is near the property boundary. Thus, there are three monitoring wells in the Plant 5A East Parking Lot.

Dames and Moore's opinion is that these three wells are installed at locations that adequately evaluate the ground water quality near the metals-containing soil. The ground water results indicate that the ground water has not been significantly impacted by metals (except chromium). The ground water results are presented in Chapter 7.

6.2.2.6 Summary

The analytical results for these soil samples indicate that the soil below most of the Plant 5A East Parking Lot contains elevated levels of metals. The metals are present from the ground surface to bedrock. However, based on EP Toxicity Test results and analytical results of the ground water beneath this area, the metals are relatively immobile.

Dames & Moore's opinion is that we have exhaustively investigated the soil in the area with the worst metals contamination (including arsenic). Based on the analytical data, there is no significant impact of those metals upon the ground water. Therefore, we believe that the arsenic present in the soil across most of the site (generally at lower levels) does not warrant further investigation or remediation.

At this time, Dames & Moore believes that no further assessment or remedial action is needed with respect to the metals in the soil at the Plant 5A East Parking Lot or with respect to the arsenic in the soil on the remainder of the site. We do recommend, however, that the Plant 5A East Parking Lot (as shown in Figure 2) not be disturbed, other than for routine maintenance.

6.3 UNDERGROUND STORAGE TANK REMOVAL, SOIL SAMPLING, LABORATORY ANALYSIS, AND ANALYTICAL RESULTS

Twenty-three underground storage tanks are known to have existed at the Assembly Plant. They are listed in Table 2 with their contents, capacities, and other pertinent information. The locations of these tanks are shown in Figure 4.

6.3.1 Introduction

This section documents the removal of 19 USTs at the Assembly Plant. It also documents the soil study that was performed around all of the former UST locations.

Nineteen USTs were removed by Dames & Moore as a part of this scope of work. Three of the USTs were regulated under RCRA. Four additional USTs were removed by Mack in 1986. All USTs removed by Dames & Moore, except USTs 1, 26, and 27, had previously been leak-tested by Mack. The testing was performed by Hunter Environmental Services (Hunter) in March and April of 1986. Hunter reported that all of the tanks were "tight." According to National Fire Protection Association's criteria, "tight" means that no tank was found to be leaking more than 0.05 gallon of contents per hour. The integrity of the associated tank piping was not tested. Test data are presented in Appendix D.

6.3.1.1 Objectives

Dames & Moore's objectives were to:

- Remove the 19 USTs and document soil quality surrounding the USTs.
- Determine the extent of soil contamination, if any, around the USTs that we removed.
- Evaluate the quality of soil beneath the four USTs previously removed by Mack.

6.3.1.2 Scope of Work

To accomplish our objectives, our scope of work consisted of:

- Cleaning, removing, and disposing of the 19 USTs and their ancillary piping.
- Collecting and analyzing soil samples to determine the quality of the soil surrounding the USTs.
- Excavating contaminated soil and treating it on-site.
- Drilling borings at the former UST locations and collecting soil samples from beneath the former tank locations.

6.3.2 Procedures

On January 11, 1988, Dames & Moore began the removal of the 19 known USTs at Plants 5A and 5C. Dames & Moore contracted Chem-Sol Co., Inc. of Bryn Mawr, Pennsylvania, to perform the work. Prior to the start of work, a tank removal permit was applied for and received from the City of Allentown Department of Public Safety. The permit and receipt for the application fee are presented in Appendix E. All field work involved with the removal of the tanks was completed on April 29, 1988.

6.3.2.1 Tank Cleaning

Before excavation work was begun, all pumpable product was removed from the tanks by Mack's contractor (B&P Environmental). A vacuum truck, subcontracted from Delaware Container Co., of Coatesville, Pennsylvania, was used to remove residue that remained in the tanks and product lines. This residue was placed in 55-gallon drums and stored on-site. B&P Environmental was responsible for disposal of all drums.

The non-RCRA-regulated USTs were cleaned with a caustic solution that consisted of 800 pounds of Occidental Chemical Caustic Soda Flake DB No. 2 and 3,000 gallons of water. The solution was mixed in the vacuum truck, blown into each tank, and then removed. Each batch of caustic was used to clean five or six tanks before it was disposed of. The spent cleaning solution for cleaning the RCRA and non-RCRA USTs was transported to the E.I. Du Pont Wastewater Treatment Plant in Deepwater, New Jersey, by American Tank Transport, Inc. of Downingtown, Pennsylvania. RCRA-regulated USTs 9, 19, and 26 were not cleaned in this manner. Cleaning procedures for these tanks will be discussed individually.

6.3.2.2 Soil Excavation and Tank Removal

The soil was excavated to the extent necessary to remove the tanks and ancillary lines. The soil around the tanks and lines was excavated and checked for contamination, visually and with a photoionization detector by Dames & Moore. The excavated soil was segregated to separate relatively clean soil from soil with measurable levels of VOCs. The contaminated soil was stockpiled on, and covered with plastic tarps. Separate stockpiles, one for clean soil and a second for contaminated soil, were kept for each excavation.

All fill, product, gauge, and vent lines, and pumps and gauges that were located outside the buildings, were removed. The pipes that entered the buildings were cut at the building walls and plugged with concrete. All pumps located inside the buildings were disconnected. After all of the lines had been disconnected, the tanks were removed by a backhoe or a crane.

Upon removal, all 19 tanks were delisted from state records by notifying the PADER Bureau of Water Quality Management with the approved notification form. A copy of this notification is presented in Appendix G.

6.3.2.3 Tank Disposal

After each tank had been removed, the tank and excavation were visually inspected by Dames & Moore and the Allentown Fire Marshal's office. After the Fire Marshal inspected each excavation and UST, he verbally approved the backfilling of each excavation. The tanks were labeled and transported to the open parking lot northeast of the Plant 5C Complex. There, each tank was purged with nitrogen until a reading of zero was measured using a MSA LD222 LEL meter. After a letter of indemnification was supplied by Chem-Sol, Deputy Chief Kohl of the Allentown Fire Marshal's office gave verbal approval to cut up the tanks on-site.

The tanks were cut with acetylene torches and sold as scrap metal to Luria Brothers of Coatesville, Pennsylvania. Transportation was subcontracted to Stanley A. Knappenberger of Walnutport, Pennsylvania. Copies of the bills of sale are presented in Appendix F.

6.3.2.4 Soil Sampling

All soil sampling was performed by Dames & Moore. The soil samples were collected from within each excavation after the tanks had been removed. Four to eight soil samples per tank were taken from within each excavation.

Two to four additional soil samples were composited from the soil stockpiles. The number of samples, and locations for each excavation, will be discussed. Soil sampling procedures are presented in Appendix B-1.

6.3.2.5 Laboratory Analyses

The soil samples that Dames & Moore collected were submitted for laboratory analysis. The analytical parameters were:

For Gasoline USTs:	Total Petroleum Hydrocarbons (TPH) and Benzene, Toluene, Xylenes, and Ethylbenzene (BTX&E)
For Oil USTs:	TPH and Acid-Extractable and Base/Neutral-Extractable Organic Compounds (AEs and B/Ns)
For the Antifreeze UST:	Ethylene Glycol

For the Virgin Solvent UST:	Volatile Organic Compounds plus a library search (VOCs+15)
For the Waste Solvent and Paint USTs:	VOCs+15 and Extraction Procedure (EP) Toxicity Metals

Where additional analytical parameters were chosen, the rationale is explained. All analytical work for the UST removal was performed by NET (Century) Laboratories of Thorofare, New Jersey.

6.3.2.6 Additional Excavation and Soil Treatment

The Commonwealth of Pennsylvania has not established uniform clean-up levels for soil. As a result, based on Dames & Moore's experience, guidelines used by Pennsylvania and nearby states, and the long industrial history of this property, the following rationale were used during Dames & Moore's UST removal program.

To date, Dames & Moore's clean-up has been confined to the total petroleum hydrocarbons (TPH) and VOCs in the on-site soil. Dames & Moore generally used two levels for the clean-up of TPH-contaminated soil. Any excavated soil that contained more than 100 ppm of TPH was treated on-site (Section 6.4). This level is consistent with New Jersey and PADER guidelines. Occasionally, 500 ppm was used as a decision level. In all cases, we excavated to remove any soil that contained TPH above 500 ppm.

Dames & Moore excavated and treated soils that contained 1 ppm or greater of total VOCs. However, in a few instances, Dames & Moore left significantly higher levels of VOCs in the ground. For those cases, Mack intends to remediate the soil using vacuum extraction techniques.

If soil samples taken from within an excavation contained elevated levels of organic compounds, additional soil was excavated. The excavation was then resampled to document soil quality and backfilled. If the composite soil samples taken from the excavated soil stockpiles exceeded acceptable levels, that soil was treated on-site. Excavated soil that did not exceed decision levels was used to backfill the excavations.

6.3.2.7 Backfilling and Resurfacing

The excavations were backfilled with Pennsylvania Department of Transportation-specified 2-A Modified Stone. Three thousand six hundred and fifty-six tons of stone was obtained from the Keystone Aggregate Products quarry in Bath, Pennsylvania. A letter of certification was obtained from the quarry's chemist stating that the stone contained neither VOCs nor metals. A copy of this letter is provided in Appendix H.

An initial 4-foot lift of crushed stone was placed and compacted into each excavation. This lift was followed by 12- to 18-inch lifts to grade. Soil was mixed with the stone to provide a uniform and easily compacted backfill. Lifts were placed with a bulldozer and compacted with at least six passes of a vibratory roller. The backfilled areas were resurfaced where necessary with at least 4 inches of asphalt.

6.3.2.8 Soil Borings

At three former UST locations, soil borings were performed to delineate the lateral and vertical extent of soil contamination. Soil borings were also performed to document soil conditions at the former locations of the USTs previously removed by Mack.

Borings were performed from April 15 to 30 1988, by Beachwood Drilling of Laurel Springs, New Jersey. Dames & Moore monitored the work, logged the borings, and collected the soil samples. The borings were drilled using 4-inch-diameter solid-stem augers. Continuous standard split-spoon samples were collected from the surface to refusal. Soil samples from each 2-foot interval were placed in jars and sealed with aluminum foil. After several minutes, headspace readings were taken with the PID. Based on PID readings, soil samples were selected from each boring for laboratory analyses, which were performed by NET (Century) Laboratories. The removal of each specific tank and the associated investigation are discussed in subsections 6.3.3 through 6.3.18.

6.3.3 Underground Storage Tank 1

6.3.3.1 Background Information

UST 1 was a 5,000-gallon, steel, No. 2 fuel oil tank. It laid approximately 2 feet beneath the concrete floor inside the southeast corner of the Plant 5A Building.

Mack records indicate that the tank was 27 years old. It was installed in 1961, just outside what was then the loading dock area. The product stored in the tank had been used to fuel the furnaces that supplied heat to the Plant 5A Building.

The tank was taken out of service around 1972, when Building 5A was extended over this area. It was disconnected and covered with concrete, leaving no available access to the tank. Approximately 1,000 gallons of oil remained in the tank.

6.3.3.2 Tank Removal

Excavation to remove the tank began on January 20, 1988. The concrete slab above the UST was broken up by jackhammer, and the soil above the tank was excavated. No odor or visible contamination was present in the soil excavated from around the tank. The excavated soil was stockpiled inside the Plant 5A Building.

The UST was removed on January 26, 1988, and inspected for holes. The tank was in very good condition. There were no signs of holes or excessive corrosion. The 4-inch-diameter iron fill line at the south end of the tank and the 2-1/4-inch-diameter copper product lines connected at the north end of the tank showed no signs that they had previously leaked.

6.3.3.3 Sampling, Laboratory Analyses, and Analytical Results

After the UST had been removed, soil samples were collected from the excavation and the stockpiled soil. The sampling locations from the excavation are shown in Figure 28. A summary of the analytical results is presented in Table 18.

6.3.3.3.1 Excavation Samples

Six soil samples were collected from the bottom and ends of Excavation 1. The east and west sidewalls of the excavation consisted of concrete footings that extended the length of the excavation. Because of these footings, no soil samples were taken along the excavation walls.

All six soil samples were analyzed for TPH. One sample, taken from below the product line in the northeast corner of the excavation, was analyzed for AE and B/Ns. This sample location was chosen as the most likely point to involve fuel oil contamination.

The concentrations of TPH in the soil samples ranged from 79 ppm to 460 ppm. Total AE and B/Ns concentrations in sample 1-F were 0.18 ppm.

6.3.3.3.2 Soil Stockpiles

Two soil samples were composited from the stockpiles of excavated soil. Both samples were analyzed for TPH.

One of the composite soil samples, 1-G, contained 210 ppm of TPH. The other composite soil sample, 1-H, contained 69 ppm of TPH. Dames & Moore recommended that the excavation be backfilled. The PADER was notified, and concurred.

The excavation was backfilled to the floor surface with crushed stone and soil. The area was not resurfaced. No soil from this excavation had to be treated or disposed of. Based on the analytical results, Dames & Moore's opinion is that no additional clean-up actions are warranted at Excavation 1. The Plant 5A Building has since been removed.

6.3.4 Underground Storage Tank 2

6.3.4.1 Background Information

UST 2 was a steel, 10,000-gallon, No. 2 fuel oil tank. It laid approximately 2 feet below the asphalt pavement at the base of Loading Bay Six, at the east end of the Plant 5A Building, as shown in Figure 4.

The No. 2 fuel oil stored in this UST was used to fuel the furnaces that supplied heat to the Plant 5A Building. A 3/4-inch-diameter steel product line connected the east end of the tank to a pump inside the building. A 4-inch-diameter steel, direct-fill pipe was also connected to the east end of the UST.

It is assumed from Mack's records that UST 2 was initially installed in 1972, when the building was first extended and UST 1 was taken out of service. Drawings from Mack's files, dated July 23, 1979, show that the tank was originally installed beneath the pavement just outside of what was then the northern wall of the loading dock area, as shown in Figure 4.

Mack's records also show that UST 2 was excavated in 1979 and reinstalled at its final location outside Loading Bay Six. The relocation became necessary when a second extension to the loading dock was constructed over the tank's former location.

6.3.4.2 Tank Removal

Excavation for the removal of UST 2 began on January 25, 1988. Slight fuel oil odors were detected in some of the excavated soil. The soil was segregated accordingly and stockpiled on the paved area adjacent to the excavation.

After it was removed, the tank was inspected and found to be in good condition. It had no signs of holes, excessive corrosion, or weak spots. The fill pipe and product line were also inspected and showed no signs of previous leaks or corrosion.

6.3.4.3 Sampling, Laboratory Analyses, and Analytical Results

Soil samples were collected and analyzed to determine the quality of the soil in the excavation and the stockpiles. Sampling locations from within the excavation are shown in Figure 29. A summary of the analytical results is presented in Table 19.

6.3.4.3.1 Excavation Samples

After UST 2 had been removed, six soil samples were taken from within the excavation. Five of these soil samples were collected around the edges of the concrete pad at the bottom of the excavation. The sixth soil sample was collected from below the product line where it entered the building.

All six soil samples were analyzed for TPH. The soil sample (AT-2-F) taken from below the product line was also analyzed for AEs and B/Ns. The area sampled was anticipated to be most likely to involve fuel oil contamination, if any was present.

Concentrations of TPH in the soil samples ranged from none detected to 65 ppm. None of the soil samples collected from within the excavation contained significant concentrations of TPH. Total AEs were not detected. B/N concentrations in sample 2-F were detected at trace levels.

6.3.4.3.2 Soil Stockpiles

One soil sample was composited from each of the three soil stockpiles. Each sample was analyzed for TPH. The analytical results ranged from non-detectable to 180 ppm (stockpile 2-G) of TPH.

To reduce the quantities of soil that needed to be treated, stockpile 2-G, which contained approximately 90 cubic yards of soil, was divided into four smaller piles and resampled for TPH. Only one of these four samples (2-B2) contained levels of TPH that warranted treatment. As shown in Table 19, that sample contained 460 ppm of TPH. The soil in this stockpile, approximately 28 cubic yards, was treated on-site.

Based on analytical results, Dames & Moore's opinion is that no additional actions are warranted at the former location of UST 2. The excavation was backfilled with crushed stone and soil.

6.3.4.4 Additional Actions

Additional actions were also performed at the original location of UST 2 beneath the loading dock extension at the east end of the Plant 5A Building.

One soil boring was drilled at the original location of UST 2 as shown in Figure 18. The purpose of this boring was to document soil conditions below the former UST's location, and to determine the quality of the soil. When the tank was initially excavated and relocated, the soil quality was not documented. However, since UST 2 had been inspected and was found to be in good condition, any soil contamination would likely have been caused by leaks in the lines.

A boring was completed inside Plant 5A to a depth of 16.3 feet. No visible contamination or odor was noted. PID readings on headspace samples did not indicate any organic vapors. The boring log is presented in Appendix C-3. A composite soil sample was collected from a depth of 15 feet to refusal and was analyzed for TPH and B/Ns. The sample was found

to contain 97 ppm of TPH and trace levels of B/Ns. These results are presented in Table 20. Dames & Moore's opinion is that no further actions are warranted in this area.

6.3.5 Underground Storage Tank 3

6.3.5.1 Background Information

UST 3 was a 3,000-gallon, steel, leaded gasoline tank. It laid approximately 3 feet below the asphalt pavement at the northeast corner of the Plant 5A Weigh Station, as shown in Figure 18.

The tank was used to store gasoline dispensed at a pump approximately 8 feet east of the north end of the tank. A 2-inch-diameter steel product line connected the pump to the north end of the tank. A 4-inch-diameter direct-fill pipe was also connected to the tank's north end.

UST 3 is believed to have been about 10 years old. Mack's records indicate that the tank was installed in 1978 by Petroleum Contractors, Inc. of Allentown, Pennsylvania. UST 3 replaced an earlier underground gasoline storage tank that had been removed from the same area.

Mack's Appropriations File AL-2467-C states that the old 3,000-gallon tank had "developed a leak above the present level of fuel in the tank," which was "allowing water to seep into the tank, contaminating the gasoline in the tank." A copy of this document is presented in Appendix I. Field inspections and laboratory analyses were performed on the surrounding soil during the removal of UST 3 in 1988. Results indicate that this "leak" had not allowed product to be released from the tank and contaminate the surrounding soil. This matter is discussed in detail in subsections 6.3.5.2 and 6.3.5.3. Available records show that the original tank was installed sometime between 1951 and 1969 by Gulf Oil Company. Water had been present in the fuel that was removed from the tank prior to the tank's removal.

6.3.5.2 Tank Removal

The excavation of UST 3 began on January 19, 1988. Gasoline odors were noted in the excavated soil. The soil was segregated accordingly and stockpiled on the paved areas north and west of the excavation. During the excavation, a large concrete column and footing were discovered abutting the tank on the east side. An 8-inch, cast-iron water main was also exposed in the southeast corner of the excavation. The footing and water main are shown in Figure 30.

UST 3 was removed from the excavation on January 22, 1988. The tank was inspected and found to be in good condition. There were no signs of excessive corrosion, holes, or weak spots.

The fill around the UST had been a coarse gray sand and gravel. This lithology differed significantly from the fine sandy silt overburden around the excavation. During excavation, a slight gasoline odor was detected in the fill material around the fill pipe and the north end of the tank. PID readings taken while this soil was being excavated ranged from 5 to 70 units. However, no PID readings were detected in the native soil below the tank. Dames & Moore's opinion is that the contamination in the soil around the tank may have been caused by limited surface spills that occurred while the UST was being filled.

Inspection of the soil beneath the former pump location detected moderate gasoline odors and PID readings ranging from 20 to 50 units. The soil was initially removed to a depth of 2 feet, but odors and PID readings persisted. No holes or evidence of previous leaks was seen in the piping below the pump.

6.3.5.3 Sampling, Laboratory Analyses, and Analytical Results

Soil samples were collected and analyzed to determine the quality of the soil in the excavation and soil stockpiles. The sampling locations within the excavation are shown in Figure 30. A summary of the analytical results is presented in Table 21. Four soil samples were collected from within the excavation after the tank had been removed. Two additional soil samples were composited from the two soil stockpiles. All samples were analyzed for TPH. Based on the PID readings registered at the sampling locations, three of these samples were also analyzed for BTX&E. The soil that registered the highest PID readings was submitted for analysis. The soil sample (3-E) that was collected from beneath the former gasoline pump contained 3,300 ppm of TPH. One of the three soil samples collected from the stockpiles contained 64 ppm of total BTX&E. The other samples did not contain detectable concentrations of BTX&E. Based on these results, stockpile 3-G, which consisted of approximately 10 cubic yards of soil, was treated on-site.

6.3.5.4 Additional Actions

Based on the analytical data, Dames & Moore recommended additional actions around the former gasoline pump. First, in an attempt to remove all of the affected soil, Dames & Moore excavated additional soil from beneath the former pump location and sampled the soil. Then, because the problem appeared to be more extensive, Dames & Moore drilled four borings and collected soil samples to evaluate the horizontal and vertical extent of the contamination. These results indicated there was not a large quantity of affected soil. Thus, Dames & Moore excavated the area beneath the pump a third time. The excavated soil was treated on-site. Dames & Moore's opinion is that this remedial action adequately addressed the contaminated soil. Each of these three additional actions are discussed in this subsection.

6.3.5.4.1 Second Round Excavation, Soil Sampling, and Analytical Results

The soil beneath the former gasoline pump was excavated an additional 4 feet to a total depth of 6 feet. A soil sample (3-A2) was taken at the base of the new excavation. This soil sample was analyzed for TPH and BTX&E. A summary of the analytical results is included in Table 21. The soil from a depth of 6 feet below the former gasoline pump contained 850 ppm of TPH and 1,709 ppm of total BTX&E. Approximately 3 cubic yards of soil was removed and stockpiled for treatment. During excavation, PID readings increased with depth. Dames & Moore decided that removal of the contaminated soil by excavation may not be feasible, and therefore recommended soil borings.

6.3.5.4.2 Soil Borings and Analytical Results

Dames & Moore drilled four borings near the former gasoline pump at the excavation. The purpose of these borings was to define the lateral and vertical extent of soil contamination surrounding the former pump location. All of the soil samples were field-tested for VOCs with a PID. Based on these PID readings, soil samples were selected for analyses. One soil sample per boring was collected and analyzed for TPH and BTX&E. The boring locations are shown in Figure 31. The analytical results are summarized in Table 22. The boring logs are found in Appendix C-3.

Boring 3A, which was located directly below the former pump location, contained the maximum concentration of TPH (280 ppm) and BTX&E (0.092 ppm). Based on these results, and those of sample 3-A2 collected after the second round of excavating, the horizontal extent of contamination was apparently limited to the area directly below the former pump. The best way to remediate this situation was to excavate the soil and treat it on-site.

6.3.5.4.3. Third Round Excavation, Soil Sampling, and Analytical Results

On July 26, 1988, the soil from the area beneath the former pump was excavated to a depth of 10 feet. Approximately 27 cubic yards of soil was excavated and treated. The limits of excavation were determined by PID readings and the presence of visible contamination.

Three soil samples were collected from the margins of the new excavation. These samples, designated 3-X, 3-Y, and 3-Z, were analyzed for TPH. Soil samples 3-Y and 3-Z were also analyzed for BTX&E. Sample 3-X was analyzed for total VOCs. The locations of the soil samples are shown on Figure 31. The analytical results are contained in Table 21.

Concentrations of TPH in the three samples ranged from 15.0 ppm to 29.3 ppm. Most of the VOCs in samples 3-X, 3-Y, and 3-Z were also found in the laboratory blanks. Thus, Dames & Moore's opinion is that the soil remediation is complete.

6.3.6 Underground Storage Tanks 4 and 5

6.3.6.1 Background Information

USTs 4 and 5 were found 2 to 3 feet below grade in the southwest corner of the Plant 5A East storage yard, as shown in Figure 4. They were parallel to each other and perpendicular to the fence along the Reading Railroad right-of-way. UST 4, the western of the two tanks, had a capacity of 20,000 gallons. UST 5 had a 15,000-gallon capacity.

Mack's records indicate that the tanks were bought in used condition in 1974 from Harry E. Orkin Co. of Slatington, Pennsylvania. Prior to installation, the tanks were sandblasted, reconditioned, and recoated with waterproof mastic by Allied Maintenance of Bethlehem, Pennsylvania. They were installed in July 1974 by Petroleum Contractors of Allentown, Pennsylvania.

According to Mack's files, the tanks were initially installed to provide emergency fuel storage in the event of a shortage. The Allentown Department of Public Safety Installation Permit states that both tanks were to be used for No. 2 fuel oil storage. Contradictory information from Mack indicated that UST 5 had been used to store antifreeze.

6.3.6.2 Tank Removal

USTs 4 and 5 were removed in April 1986 by Wolff Petroleum of Allentown, Pennsylvania. The excavation was backfilled with crushed stone. There are no records that indicate whether any sampling or analysis was performed on the soil around the former tank excavation.

6.3.6.3 Additional Actions

Additional actions were required at the former locations of USTs 4 and 5 to document soil conditions and to determine whether any product releases had occurred from the tanks. Four soil borings were drilled at the former locations of the two USTs. The purpose of these borings was to document soil quality directly below the former tanks, and to determine whether any releases had occurred. Continuous, 2-foot, split-spoon samples were taken at each boring from a depth of 13 feet (the depth of the base of the former USTs) to refusal. Laboratory analyses were performed on samples collected at the elevation of the former tank bottoms and at refusal, in addition to any samples that contained visible contamination or foreign odors. Selected

samples from below UST 4 were analyzed for TPH and B/Ns. Samples from below UST 5 were analyzed for TPH and ethylene glycol. Boring locations are shown in Figure 18. Analytical results are summarized in Table 23. Boring logs are presented in Appendix C-3.

Concentrations of TPH in the soil samples ranged from non-detectable to 36 ppm. No concentrations of ethylene glycol (antifreeze) or B/Ns were found above minimum detection levels. Based on these analytical results, Dames & Moore's opinion is that no further actions are required at Excavations 4 and 5.

6.3.7 Underground Storage Tanks 6, 7, and 27

6.3.7.1 Background Information

USTs 6, 7, and 27 were located beneath the paved parking area at the northwest corner of the Plant 5C Assembly Building, approximately 30 feet north of the Wash House, as shown in Figure 4. The tanks are believed to have been approximately 60 years old.

USTs 6 and 7 were 12,000-gallon steel tanks buried approximately 7 feet below grade. The tanks were oriented parallel to each other, in an east-west direction. A 5-by-7-foot reinforced concrete vault was situated atop the east end of each tank. Steel hatchways at the ground surface provided access to the vaults and the tanks below. The direct-fill pipes and all product, vent, and gauge lines were connected to the tanks within the vaults. Eight to ten previously disconnected and capped lines also entered each vault on the east side.

At the time of their removal, USTs 6 and 7 contained gasoline and diesel fuel, respectively. The tanks' only working connections were to two fuel pumps, at the southeast corner of the Wash House. According to plant maintenance personnel, UST 6 had not been used for an indefinite period of time, due to the repeated discovery of water in the tank after rain. UST 7 was still in use.

UST 27 was an 11,000-gallon steel tank 3 feet north of, and perpendicular to, UST 7. It was buried approximately 5 feet below grade. At the time of its removal, the tank was not in use and had been filled with sand. A 5-by-10-foot reinforced concrete vault was situated on the north end of the tank. Approximately eight previously disconnected and capped lines entered the vault on the east side. The vault had been backfilled with crushed stone and the ground surface had been paved over. The existence of UST 27 was not known by Dames & Moore or Mack maintenance personnel prior to excavating.

Mack's historical records indicate that UST 27 was abandoned in place in August 1972 by Petroleum Contractors of Allentown, Pennsylvania. These records state that the tank was taken out of service due to the constant presence of water in the product. A copy of this file is presented in Appendix I. Mack's records also show that prior to 1972, UST 27 was used to store leaded gasoline. However, Mack's drawings, which are dated March 21, 1927, and January 16, 1928, indicate that UST 27 may initially have been designed and used for the storage of "lacquer thinner."

Drawings and records found in Mack's files show that USTs 6, 7, and 27 stored product for distribution to a number of locations during their history. The existence of at least 24 previously disconnected pipes discovered during the tank excavations appears to confirm the drawings and findings. The drawings dated March 21, 1927, and January 16, 1928, show that the fill lines for the three tanks were initially located along a railroad spur that extended between the Plant 5C Boiler House and the north wall of the Plant 5C Assembly Building.

Drawings dated July 7, 1950, show that the USTs stored gasoline and diesel fuel to be used at various points on the bus and truck assembly lines inside the Plant 5C Assembly Building. Underground distribution lines connected the tanks to several dispensing points throughout the building.

Sometime after 1950, the tanks were connected to gasoline and fuel oil lines inside the Wash House. Product stored in these tanks had also been dispensed from at least three different pump locations outside the Assembly Building. Based on available drawings, the pump locations were:

- At a pump house situated between the tanks and the west wall of the Assembly Building.
- On the south side of the Wash House.
- On the southeast corner of the Wash House.

6.3.7.2 Tank Removal

Excavation for the removal of USTs 6 and 7 began on February 4, 1988. Throughout the excavation work, a distinct gasoline odor was noticed in most of the soil that was removed. The soil was segregated and stockpiled accordingly. During excavation, an 8-inch-diameter, vitrified-clay storm drain pipe, running north-south along the east end of the USTs, was broken. A 60-foot section of broken pipe was removed and replaced with corrugated plastic pipe.

USTs 6 and 7 were removed from the excavation by crane on February 19, 1988, and inspected for holes. Both tanks were extremely pitted and in very poor condition. UST 6 had two visible holes, 1/4 inch and 1/2 inch in diameter, near the top of

its east end. UST 7 contained one 1/2-inch-diameter hole in the upper east end of its north side. There were also two small pinholes in the very bottom of the east end. Mr. James Dolan of the PADER was notified of the condition of these tanks and the surrounding soil.

UST 27 was discovered during excavation of USTs 6 and 7. Most of the soil surrounding this UST emitted a noticeable gasoline odor, and was stockpiled accordingly. UST 27 could not be removed by crane from the excavation because of the weight of the sand and water in the tank and the presence of low overhead powerlines.

To remove the sand and water from UST 27, the top of the tank was removed with an electric hacksaw. Approximately 4,000 gallons of water was pumped out of UST 27 and temporarily stored in UST 6. The sand was sampled and an estimated 35 cubic yards of sand was excavated from the tank and treated on-site.

The tank was cut up in-place with acetylene torches and removed on February 29, 1988. UST 27 was extremely pitted and corroded with more than one dozen holes ranging in size from 1/8 inch to 2 inches. All of the visible holes were in the upper half of the tank. The PADER was notified of the condition of the tank on February 22, when it was first uncovered but had not yet been removed.

Approximately 26 product, fill, vent, and gauge lines were uncovered during tank excavation. Most of these lines were connected to the eastern sides of the tanks. The only two lines that were still in use connected USTs 6 and 7 to the fuel pumps at the southeast corner of the Wash House. These two lines were excavated and removed. All other lines were removed to the edge of the excavation and plugged with concrete.

Based on PID readings, the greatest concentration of VOCs occurred in the soil surrounding the concrete vaults and at the north end and east side of UST 27. These areas are where all of the product and fill lines for the tanks had been. The level of VOCs in the soil lessened to the west but was concentrated along the eastern and southeastern walls of the excavation. During the excavation of the eastern end near UST 6, PID readings in the soil registered 300 units beginning at a depth of 2 feet (the depth at which most of product lines were buried) and increasing to 500 units at the base of the excavation (17 feet).

Puddles of free product (gasoline and diesel fuel) were found in the soil while the pumps and product lines were being excavated along the eastern side of the Wash House.

6.3.7.3 Sampling, Laboratory Analyses, and Analytical Results

The soil and water samples were analyzed to determine the contents of UST 27. The soil in the excavation and from the stockpiles was also sampled. The locations of the soil samples from within the excavation are shown in Figure 32. A summary of the analytical results is presented in Table 24.

6.3.7.3.1 UST 27 Contents

Samples of the water and sand from UST 27 were analyzed for VOCs. The water sample contained 0.338 ppm of total VOCs. The sand in the tank contained 332 ppm of total VOCs. Most of the compounds found in these two samples are constituents of gasoline (BTX&E). However, 12 ppm of 2-butanone (methyl ethylketone) was detected in the sand sample and 0.085 ppm of 1,2-dichloroethane was detected in the water sample. The water was disposed of with the tank rinse water at the E.I. Du Pont Waste Water Treatment facility. The sand is being treated on-site under a PADER-approved program (Section 6.4).

6.3.7.3.2 Excavation Samples

The initial round of sampling consisted of 19 soil samples taken from the bottom and sidewalls of the excavation after the USTs had been removed. The locations of these soil samples are shown in Figure 32.

All 19 samples were analyzed for TPH. Based on PID readings, seven of the samples were also analyzed for BTX&E. One soil sample (7-A) taken from the bottom of the east end of UST 7 (diesel tank) was analyzed for acid-extractable and base/neutral-extractable organic compounds (AEs+B/Ns). This sample location was chosen because most of the visible contamination near UST 7 occurred in this area.

Concentrations of TPH in the excavation samples ranged from less than detectable to 4,400 ppm. Samples 27-E (taken from the northern wall) and 27-H (taken from the bottom northeast corner of the excavation) contained 1,000 and 1,100 ppm, respectively. Sample 6-F (taken from the bottom of the excavation between USTs 6 and 7) contained 670 ppm. Samples 6-G and 6-H (taken in the southeast corner of the excavation from the eastern and southern walls, respectively) contained the highest concentrations - 4,400 ppm and 2,000 ppm, respectively.

BTX&E was detected in four of the seven soil samples collected from within the excavation. Samples 27-H, 6-C, 6-D, and 6-I contained 78 ppm, 643 ppm, 70.2 ppm, and 64 ppm of BTX&E, respectively. No acid or base/neutral extractables were detected in sample 7-A.

6.3.7.3.3 Soil Stockpiles

Eight soil samples were composited from the stockpiles of excavated soil. All eight samples were analyzed for TPH. Based on the highest PID readings, three soil samples were collected and analyzed for BTX&E. Based on the analytical results, all eight composite soil samples contained levels of TPH that ranged from 100 to 680 ppm. Most of this soil was treated on-site.

All three composite soil samples contained elevated levels of BTX&E. Sample 7-E contained 96.5 ppm. Sample 7-I contained 46.7 ppm. Sample 27-G contained 1.9 ppm. Approximately 880 cubic yards of soil, excavated during the removal of USTs 6, 7, and 27, was determined to contain elevated levels of TPH or BTX&E. This soil was treated on-site.

6.3.7.4 Additional Actions

Based on the analytical results, Dames & Moore recommended additional actions at UST excavations 6, 7, and 27. First, in an attempt to remove the contaminated soil, Dames & Moore excavated additional soil. Because the problem appeared to be more extensive, Dames & Moore recommended drilling and sampling the soil from 18 borings to evaluate the horizontal and vertical extent of the contamination. Once the boring program was completed, Dames & Moore installed and sampled six monitoring wells to evaluate the on-site extent of the gasoline plume in the ground water.

6.3.7.4.1 Additional Excavation, Soil Sampling, and Analytical Results

Additional soil was removed to a depth of 18 feet at the southwestern and northwestern corners of the excavation. Dames & Moore also excavated to a depth of 6 feet beneath the former product lines along the east side of the Wash House. This area was saturated with diesel fuel and the soil was visibly contaminated. A 30-foot length of 8-inch-diameter vitrified clay storm drain pipe was removed in order to completely excavate this soil. The invert of this pipe was 3 feet below grade. The pipe was replaced with an 8-inch-diameter corrugated PVC pipe. Removal of additional soil outside the horizontal limits of the original excavation was not considered necessary.

A second round of nine soil samples was taken from the areas where additional soil had been removed. The excavation was then backfilled with crushed stone and repaved with asphalt. The locations of the soil samples taken during the second round, which are shown on Figure 32, are denoted with a number "2" after the letter designation. All second-round soil samples were analyzed for TPH and BTX&E. The analytical results are presented in Table 24. Sample 27-B2, which was taken from a 6-inch layer of black oily residue uncovered in the bottom north end of the excavation, was analyzed for VOCs+15, PCBs, B/Ns, TPH, and BTX&E.

Concentrations of TPH in the excavation from the second round of samples ranged from non-detectable to 2,600 ppm. Sample 6-A2, taken from the bottom of the southeast corner of the excavation, contained 2,600 ppm. Sample 7-B2, taken beneath the product lines 20 feet north of the gasoline and diesel pumps, contained 1,200 ppm.

One soil sample (27-B2) was analyzed for VOCs+15. It was found to contain 88 ppm of total VOCs. A majority of the compounds identified are derivatives of petroleum hydrocarbons. However, trace amounts of acetone (0.062 ppm) and 2-butanone (0.034 ppm) were also found. These compounds are often associated with paint solvents. No B/N compounds or PCBs were detected in sample 27-B2.

Seven soil samples contained BTX&E. Sample 6-A2, which was taken from the bottom of the southeast corner of the excavation, contained 1,264 ppm of BTX&E. Sample 6-B2, which was taken from the base of the east wall of the excavation, contained 50 ppm of BTX&E. Sample 7-A2, taken from the soil 6 feet below the gasoline and diesel pumps, contained 103 ppm. Samples 7-B2, 7-C2, and D2, taken 6 feet below the former product lines at points 20, 40, and 60 feet north of the pumps, respectively, contained BTX&E at levels of 24 ppm, 2.6 ppm, and 39 ppm, respectively. Based on these results, Dames & Moore decided that the removal of contaminated soil by excavation may not be feasible.

6.3.7.4.2 Soil Borings, Sampling, and Analytical Results

To evaluate the lateral and vertical extent of the soil contamination, 18 borings were drilled near former UST excavations 6, 7, and 27. Continuous 2-foot, split-spoon samples were taken from the surface to refusal at each boring. All samples were field-tested for VOCs using a PID. Based on PID readings, soil samples were selected for laboratory analyses.

Additional analyses were performed on the sample registering the highest PID reading for each boring. A second sample was further analyzed from the depth below the first sample where the lowest PID readings were registered, or where no visible or aromatic contamination was present. Each sample was analyzed for TPH and BTX&E. The purposed of these analyses was to identify the peak concentrations and vertical extent of contamination in each boring. Based on analytical results of the samples tested, PID readings, and observations of the samples that were not laboratory tested, TPH and BTX&E concentrations were extrapolated for each 2-foot interval in each boring. The boring logs, including PID readings, are presented in Appendix C-3. Analytical results are summarized in Table 25.

Concentration contours of BTX&E in the soil surrounding these borings at selected depths are shown in Figures 33 through 37. Concentration contours of TPH at selected depths are shown in Figures 38 through 42.

As shown in Figures 33 and 38, at a depth of 1 to 3 feet elevated levels of TPH and BTX&E are extensive, but not at peak levels. The greatest concentrations of contaminants occur along the former product lines. TPH levels in this area were approxiately 3,400 ppm at boring 6D, 2,000 ppm at boring 6C, and 1,600 ppm at boring 6B. BTX&E concentrations were 2.3 ppm in boring 6D, and 30 ppm in borings 6C and 6B. The product lines had been buried at a depth between 2 and 3 feet.

Elevated concentrations of TPH (1,100 ppm) and BTX&E (40 ppm) were also present in boring 60 at the southwest corner of the Wash House. Because of the soil sample's proximity to the surface, the levels in this area are presumed to be from a separate source. Note that the concentrations drawn below the Wash House are inferred.

The width of the elevated TPH and BTX&E concentration contours decreases with depth. However, the concentrations of both contaminants increase with depth at the eastern ends of the tanks and reach peak levels at a depth of 11 to 13 feet, as shown in Figures 34 and 39. TPH levels in boring 6C were as high as 7,500 ppm. BTX&E concentrations in boring 6C peaked at 7,250 ppm. Concentrations in boring 60 were greatest at the surface and diminished with depth. TPH levels at 11 to 13 feet were 550 ppm; BTX&E levels were 25 ppm. The source of contamination in this area was probably a surface spill.

As shown in Figures 35 and 40, at a depth of 17 to 19 feet BTX&E was not detected in boring 60 and TPH levels were below 100 ppm. High concentrations of TPH (5,000 ppm) and BTX&E (7,000 ppm) were still present at this depth in boring 6C. Elevated concentrations were also first detected at this depth in borings 6K, 6G, and 6I.

At a depth of 21 to 23 feet, elevated levels of TPH were present in borings 6C (600 ppm), 6L (720 ppm), and 6G (1,100 ppm). Elevated levels of BTX&E were present at borings 6C (796 ppm), 6K (11.2 ppm), 6M (2.5 ppm), and 6G (16 ppm). These results indicate that the product in the soil is moving west and east along a valley in the bedrock surface. These relationships are shown in Figures 36 and 41.

At 25 to 27 feet, elevated levels of TPH were found in borings 6L (330 ppm), 6M (920 ppm), and 6G (800 ppm). Elevated levels of BTX&E were found in borings 6M (77 ppm) and 6G (14 ppm) (Figures 37 and 42). All other borings (except 6J) had reached bedrock at this depth. Ground water was found at a depth of 25 feet. Based on the elevation of the depth of refusual for the borings, bedrock elevation contours were constructed (Figure 43).

Cross sections were constructed along D-D' (Figure 44) along the product lines and the eastern ends of the tanks, as shown in Figures 45 and 46. Cross section E-E' bisects the valley in the

dolomite bedrock. Two cross sections were constructed along E-E'; they are shown in Figures 47 and 48. These four cross sections clearly show that BTX&E and TPH have reached the bedrock and the ground water.

6.3.7.4.3 Ground Water Monitoring Wells

A series of six monitoring wells (MT-9A, MT-9B, MT-10, MT-15, MT-16, and MT-17) were installed in this area to evaluate the impact of the petroleum products on the ground water quality. The locations of these wells are shown in Figure 49. The installation of these wells, ground water sampling, analyses, and results are discussed in detail in subsections 7.2.2.3 and 7.2.2.4.

6.3.8 Underground Storage Tank 8

6.3.8.1 Background Information

UST 8 was a 2,000-gallon steel gasoline tank. It was buried approximately 2 feet below grade on the north side of the Plant 5C Boiler House, as shown in Figure 4. According to Mack records, UST 8 was installed in 1959 by Atlantic Refining Co. of Allentown, Pennsylvania.

6.3.8.2 Tank Removal

UST 8 was removed by Mack in 1986. The excavation was backfilled to grade with crushed stone. There are no records that indicate whether any sampling or analyses were performed on the soil around the former tank excavation.

6.3.8.3 Additional Actions

Two soil borings were drilled through the former UST 8 excavation. The purpose of these borings was to document the soil quality directly below the former UST. Continuous 2-foot, split-spoon samples were taken from a depth of 6 feet (the depth of the base of the former UST 8) to refusal. All samples were field-tested for VOCs with a PID using the headspace test.

No PID readings were registered in any sample collected. One composite sample was taken from each boring and analyzed for TPH and BTX&E. Boring locations are shown in Figure 50. Boring logs are presented in Appendix C-3. Analytical results are summarized in Table 26.

Concentrations of TPH found in the two soil samples were 29 and 23 ppm. Concentrations of BTX&E were 0.107 and 0.105 ppm. Based on these results, Dames & Moore's opinion is that no further action is required at Excavation 8.